STATE OF CALIFORNIA
The Resources Agency
Department of Water Resources

BULLETIN No. 106-2

GROUND WATER OCCURRENCE AND QUALITY: SAN DIEGO REGION

Volume I: Text

JUNE 1967

RONALD REAGAN
Governor
State of California

WILLIAM R. GIANELLI
Director
Department of Water Resources

ERRATA SHEET FOR

BULLETIN NO. 106-2

GROUND WATER OCCURRENCE AND QUALITY, SAN DIEGO REGION

VOLUME I: TEXT

	NOW READS	SHOULD READ
Page 75, paragraph 2, last sentence	Their major chemical constituents are the oxides of silicon, aluminum, iron, calcium, sodium, and potassium.	Their major chemical constituents are the oxides of silicon, aluminum, iron, calcium, sodium, *magnesium*, and potassium.
Page 75, paragraph 6, last line	Clayey materials, and other complex physiochemical processes	Clayey materials, and other complex *physicochemical* processes.
Page 78, paragraph 3, (conversion factors)	$\frac{Ca}{CaO} = 0.7146$; $\frac{Mg}{MgO} = 0.6032$; $\frac{Na}{Na_2O} = 0.7419$ and $\frac{K}{K_2O} = 0.8320$	$\frac{Ca}{CaO} = 0.7146$; $\frac{Mg}{MgO} = 0.6032$; $\frac{2\,Na}{Na_2O} = 0.7419$ and $\frac{2K}{K_2O} = 0.8320$
Page 150, "Industrial Waste", lines 2 and 3	"any and all liquid or solid water substances, not sewage, from any producing, manufacturing or processing operation of whatever nature."	"any and all liquid or solid *waste* substance, not sewage, from any producing, manufacturing or processing operation of whatever nature."

VOLUME II: PLATES

Plate II A

All areas where "inferred Mg Cl" is indicated should show "inferred Na Cl" instead, except for:

1. Area immediately surrounding Fallbrook (in left center of map) which is correct in showing "inferred Mg Cl."
2. Area along the coast between Las Flores Mission and Camp Del Mar which is also correct in showing "inferred Mg Cl."
3. Area just to the right of Pala, along Highway 76, which should show "inferred Ca SO_4"

The Study Area,
from Orbiting Gemini V Spacecraft,
August 1965

National Aeronautics and
Space Administration

The San Diego Region is located in the southwesternmost part of California. (Shown is Los Angeles to Baja California with San Clemente Island in foreground and Salton Sea in background.)

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FOREWORD

Bulletin No. 106-2, "Ground Water Occurrence and Quality, San Diego Region", culminates an intensive 2-year investigation of most of San Diego County, and limited portions of Riverside and Orange Counties.

This study authorized under Section 12616, Chapter 1, of the State Water Code, is the second of two reports in the Bulletin No. 106 series. The first, Bulletin No. 106-1, "Ground Water Occurrence and Quality, Lahontan Region", was published in June 1964. These investigations, because of their broad scope and vast areal extent were, by necessity, of a general nature.

The San Diego Region was selected for investigation because the surface and ground water monitoring program of the Department had indicated the existence of water quality problems of various origins.

In this investigation, the geohydrochemical approach was used to evaluate existing conditions: that is, a study was made of the chemical quality of surface and ground water as it is influenced by the geologic and hydrologic environments and modified by man's activities.

Therefore, geologic, hydrologic, and water quality studies were made of the 11 hydrologic units within the San Diego Drainage Province. Ground waters in each of these units were analyzed and classified as to their suitability for domestic and irrigation uses. Existing sources of ground water impairment were also noted because this information will serve as a basis for discerning water quality trends.

The availability of an adequate supply of water of a quality suitable for beneficial uses is a prime factor in the future cultural development and growth in the San Diego Region. This report is designed to bring into sharper focus some of the water quality problems that must be overcome if ground water is to contribute to such growth.

William R. Gianelli

William R. Gianelli, Director
Department of Water Resources
The Resources Agency
State of California

April 13, 1967

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*Courtesy of California Institute of Technology.

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State of California
The Resources Agency
DEPARTMENT OF WATER RESOURCES

RONALD REAGAN, Governor, State of California
WILLIAM R. GIANELLI, Director, Department of Water Resources

SOUTHERN DISTRICT

James J. Doody . . . . District Engineer
Herbert W. Greydanus . . . . Principal Engineer
Jack J. Coe. . . . . Chief, Planning Branch

The investigation leading to this report
was conducted under the direction of

David B. Willets* . . . . Chief, Water Quality Section
Robert C. Fox . . . . Chief, Drilling and Exploration
Unit, and Program Manager

by

Sanford L. Werner . . . . Assistant Engineering Geologist

and

Michitoshi Mukae . . . . Assistant Engineering Geologist

assisted by

Arnold Schiffman . . . . Assistant Engineering Geologist
Dale G. Wilder . . . . Engineering Student Trainee

---

*Mitchell L. Gould was acting Chief, Water Quality Section, from June 1, 1964, to September 1, 1966.

State of California
The Resources Agency
DEPARTMENT OF WATER RESOURCES

ENGINEERING CERTIFICATION

This report has been prepared under my direction as the professional engineer in direct responsible charge of the work, in accordance with the provisions of the Civil and Professional Engineers' Act of the State of California.

David B. Willets
Registered Civil Engineer

Registration No. C 5592

Date Mar 6, 1967

ATTEST:

J J Doody
District Engineer
Southern District

Registration No. C 6500

Date [illegible] 7 1967

ACKNOWLEDGMENT

Valuable assistance and data used in this investigation were contributed by agencies of the Federal government and of the State of California and by cities, counties, public water districts, and private companies, and individuals. Their cooperation is gratefully acknowledged.

Special mention is made of the cooperation of the following:

California Department of Conservation, Division of Forestry

California Department of Conservation, Division of Mines and Geology

California Department of Public Works, Division of Highways

California Institute of Technology

Mr. Josef Callison

Dr. Richard Merriam, Geology Department, Univeristy of Southern California

National Aeronautics and Space Administration

Orange County Planning Department

Riverside County Planning Commission

City of San Diego

San Diego County Department of Public Health

San Diego County Planning Department

San Diego County Water Authority

San Diego Regional Water Quality Control Board (No. 9)

San Diego State College, Geology Department

Santee County Water District

Title Insurance and Trust Company, San Diego

United States Department of Agriculture, Soil Conservation Service

United States Geological Survey

AUTHORIZATION

The Department of Water Resources has undertaken this investigation as part of the continuing evaluation of the surface and ground water quality problems in Southern California. Section 12616, Article 5, Chapter 1, Part 6, Division 6 of the California Water Code authorized the Department to conduct these investigations:

> "The department may conduct investigations of the water resources of the State, formulate plans for the control, conservation, protection, and utilization of such water resources, including solutions for the water problems of each portion of the State as deemed expedient and economically feasible, and may render reports thereon. In conducting such investigations and formulating such plans, the department may conduct investigations and surveys to determine the availability, usability, extents, and boundaries of underground basins."

In addition, this investigation of the ground water resources of the San Diego Region has been made in support of the activities of the San Diego Regional Water Quality Control Board (No. 9), and the many local water districts, agencies, water purveyors, and private citizens who have a direct and very real interest in the Region's water resources.

ABSTRACT

The San Diego Region, with a 1965 population of more than 1,200,000 persons largely centered in metropolitan San Diego, is a vast mountain and valley expanse of 3,900 square miles. With increasing development of the Region and a sustained drought, the water supply problem and its apparent consequences became matters of concern. To meet the water needs of the populace, it was necessary, beginning in 1947, to import Colorado River water. / Prior to that, reservoir releases and sustained heavy extractions of ground water were required in the populated coastal and developed inland areas. This pumping resulted in the impairment of the ground water quality by accelerating the lowering of water levels, which led to the intrusion of sea water and the migration of connates into the ground water reservoirs. / Chemical characteristics of ground water in alluvium and residuum throughout much of the Region are highly variable and depend largely on the watershed environment and local conditions resulting from man's activities. The effects of man's activities are particularly far-reaching where there have been heavy ground water extractions accompanied by a deficiency of precipitation and, consequently, little ground water movement to recharge and flush out the water-bearing materials. The use of supplemental waters by man to sustain his presence in the Region has also modified the chemical quality of the native ground water. / In the inland portions of the Region, native waters associated with continental Pleistocene sediments and with crystalline rocks tend to be sodium to calcium bicarbonate in character. These waters generally have a total dissolved solids concentration of less than 600 parts per million. Waters associated with the more basic crystalline rocks, such as the gabbros, are relatively rich in magnesium. / In the coastal portion, pre-Quaternary sediments, where water bearing, contain waters having a total dissolved solids content that generally falls within a range of 400 to 2,000 parts per million. Sodium and chloride ions generally predominate in association with calcium and bicarbonate ions. / Plates and figures depict geologic, hydrologic, and water quality findings and relationships.

CHAPTER I. INTRODUCTION

The spectacular growth of the San Diego Region, especially the area centered around the City of San Diego, has brought an equally rapid increase in the demand for water. During the past several years, ground water storage in some areas has been virtually exhausted, making large portions of the Region almost fully dependent on imported Colorado River water. In fact, during the period July 1, 1963 through June 30, 1964, about 80 percent of the Region's needs were met by imported water.

Although low precipitation and lack of extensive ground water reservoirs in the Region as a whole make it impossible for local supplies to fill more than a relatively small portion of the water requirements, further development of ground water resources in other parts of the Region is necessary.

Development of additional information on the occurrence, movement, and quality of ground water is a prerequisite to optimum utilization of this local supply. Therefore, the Department of Water Resources undertook a systematic survey of ground water conditions in the 11 hydrologic units and 54 hydrologic subunits of the San Diego Region shown on Plate 1.

OBJECTIVES OF INVESTIGATION

The objectives of this investigation were to determine the water quality conditions in the study area and to identify the nature and extent of the water quality problems.

Programs for which this investigation will form the initial phase include projects under the Porter-Dolwig Ground Water Basin Protection Law; advice to the San Diego Regional Water Quality Control Board (No. 9); and long-range planning studies for water.

SCOPE OF INVESTIGATION

The area investigated - the San Diego Drainage Province - is referred to as the San Diego Region in this report. It includes that part of San Diego County which drains to the Pacific Ocean and portions of Orange and Riverside Counties (Plate 1).

For this study, available geologic, hydrologic, and water quality data in the files of the Department and other public and private agencies were reviewed, and pertinent information was extracted and compiled.

Investigations in the field included reconnaissance geologic mapping, well canvassing and ground water level measuring, ground and surface water sampling, analyzing of samples for chemical constituents, and reviewing developed portions of the Region to determine land and water use.

The investigation was conducted from December 1963 through December 1965. Most data presented in this bulletin were collected subsequent to January 1960. Some data collected as early as 1950 were reviewed and pertinent information from these data is included within the Bulletin.

A list of reports, on earlier investigations, which were reviewed during the course of this investigation, is presented in Appendix A.

AREA OF INVESTIGATION

The San Diego Region, shown on Plate 1, is a northwesterly trending, approximately oblong area of about 3,900 square miles. It is located in the southwesternmost part of California, largely in San Diego County and partly in Orange and Riverside Counties. This area, the same as that under the jurisdiction of the San Diego Regional Water Quality Control Board (No. 9), is defined in Section 13040(f), Article 1, Chapter 4, Division 7 of the California Water Code as comprising "all basins draining into the Pacific Ocean between the southern boundary of the Santa Ana Region and the California-Mexico Boundary."

The Region averages about 45 miles in width and extends for approximately 80 miles along the Pacific Coast, from the drainage divide in the San Joaquin Hills near Laguna Beach, south to the United States-Mexico International Boundary.

Topography

The most prominent physical feature of the Region is the northwest-to-southeast trending Peninsular Range that comprises the Santa Ana, Agua Tibia, Palomar, Hot Springs, Aguanga, Volcan, Cuyamaca, and Laguna Mountains. Elevations vary from sea level to 6,811 feet at Thomas Mountain, located in the northeast corner of the Region due north of Anza.

Eight principal stream systems, originating on the western slope of the Peninsular Range, discharge into the Pacific Ocean. From north to south these are San Juan Creek and the Santa Margarita, San Luis Rey, San Dieguito, San Diego, Sweetwater, Otay, and Tia Juana Rivers.

Climate

The climate near the coast is generally mild. Temperatures average about 65 degrees Fahrenheit and precipitation averages 10 to 13 inches. Proceeding inland, as elevations increase, average temperatures decline to 57 degrees Fahrenheit in the Laguna Mountain area and precipitation increases to more than 45 inches in the Palomar Mountain area. Temperature and rainfall intensity variations are larger in the inland portions. The recorded maximum is 11.5 inches of rainfall in 90 minutes at Campo on August 12, 1891. Precipitation occurs principally as rain, with snow common only in the high mountains.

Cultural Development

Historically, development in the San Diego Region has centered around irrigated agriculture, livestock, and mining. However,

Irrigated Agriculture
near Fallbrook, 1963

From the Historical Collection
of Title Insurance and Trust Company
San Diego, California

Avocados have continued as a principal produce.

within the past 25 years, the construction of military installations and manufacturing facilities, such as the aerospace industries, has brought a population influx that has radically changed the pattern of development, particularly in the western portions of the Region. The discussion on cultural development in the following section has been divided into agriculture, urban and suburban, and mining activities.

Agriculture

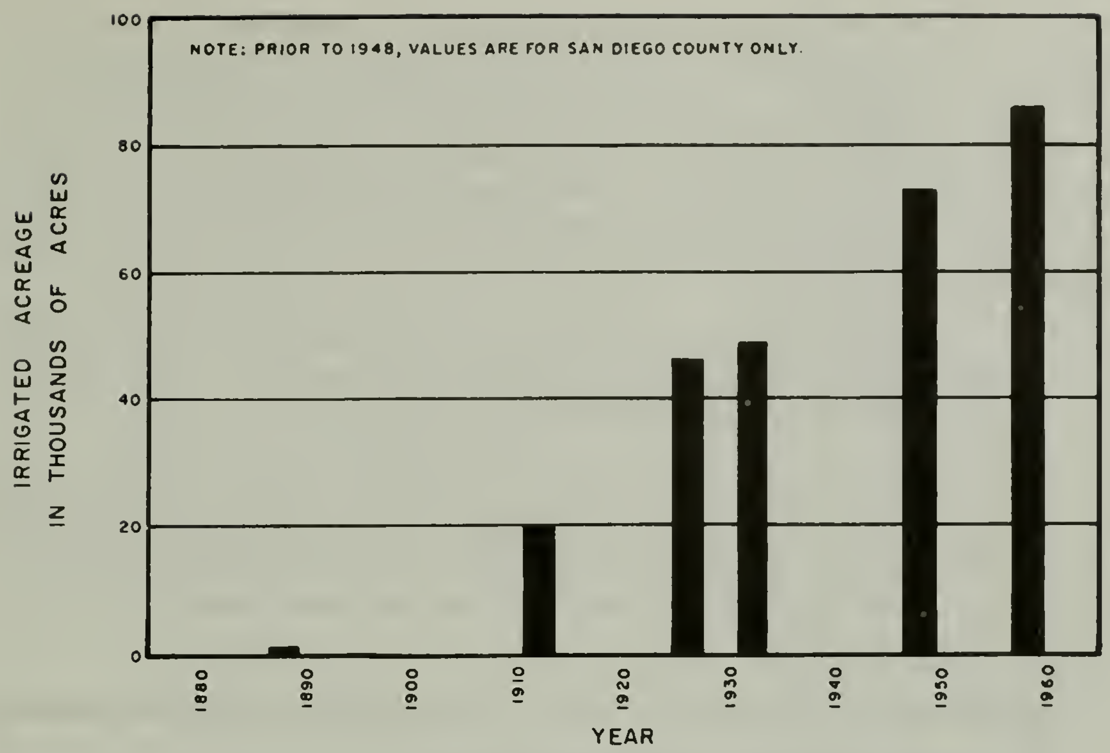
Agriculture and the raising of livestock, which have long been major economic activities in the area, are dependent upon the development of water supplies in the Region. Early settlers diverted flows of surface streams in the mountain valleys for the irrigation of forage crops and for livestock watering. Later, ground water supplies were developed to support increasing acreages of irrigated crops.

The first known agricultural development in the San Diego Region came with the founding of Mission San Diego by the Franciscan Fathers in 1769. Water from the San Diego River, originally obtained by surface diversion and later supplemented by wells dug in the river, was used to irrigate fields surrounding the Mission. Similar agricultural development accompanied the establishment of Mission San Luis Rey and San Juan Capistrano.

Not until the latter half of the 19th century did significant expansion of irrigation begin. This development was brought about mainly by completion of the first railroad in 1885 from Los Angeles to San Diego and the resulting real estate boom. However, until the completion of the Sweetwater and Cuyamaca water systems, irrigation was confined to the small and scattered areas in the various stream valleys. The irrigated acreage increased steadily as additional surface water storage and diversion facilities were constructed and as ground water supplies were utilized.

Winter truck crops were first grown commercially near San Diego about 1910, and avocados and other subtropical fruits in 1915. The mild climate with long frost-free periods was found highly favorable for production of these crops and was, therefore, influential in stimulating an intensive agricultural development in areas where water was available.

The growth of irrigated agriculture, based on surveys made in 1888, 1912, 1926, 1932, 1948, and 1958, is shown on Figure 1. The amount of irrigated agriculture increased more than tenfold between 1888 and 1912, and more than doubled between 1912 and 1926. These were the periods in which



IRRIGATED AGRICULTURE IN SAN DIEGO REGION

FIGURE I

increasing amounts of water were developed for irrigation. Increases in irrigated agriculture acreage between 1926 and 1932 were minor. After that, lands were again brought into production at an increasing rate.

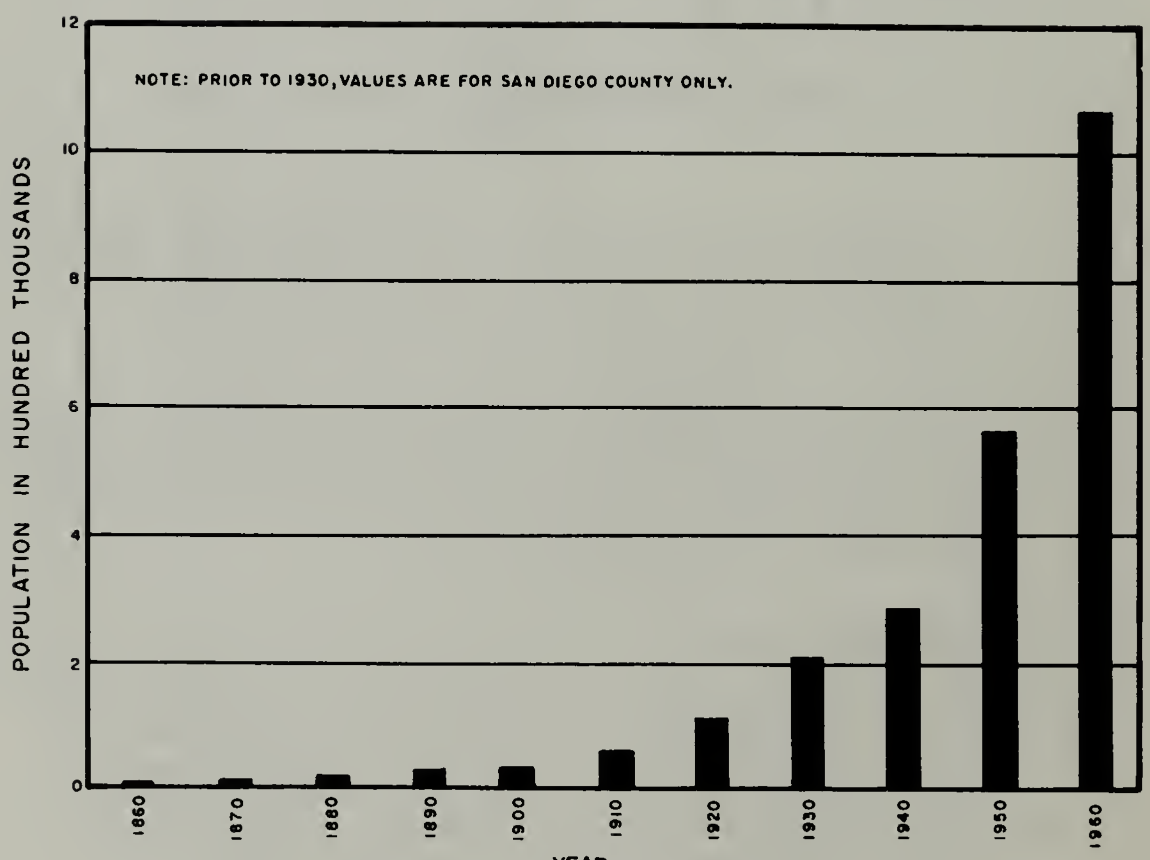
The pattern of agricultural land use has remained fairly stable during the past half century, with avocados, citrus, and truck crops continuing as the principal produce. Despite the encroachment of urban and suburban development on zoned agriculture lands, irrigated agriculture has continued to increase at a fairly stable rate.

Urban and Suburban

The population of the San Diego Region, which grew slowly until the latter part of the 19th century, was limited in large part by a lack of firm water supplies and adequate transportation facilities. After the turn of the century, with the initiation of several water development projects and the completion of the first railroad, the population of the area began a generally steady but accelerated growth -- the rate of which exceeded that of either the State or the nation during the first half of the 20th century. As shown on Figure 2, the population of San Diego Region increased to 1,062,100 in 1960. In 1965, the population exceeded 1,200,000. Of this total, about 90 percent resided within the area serviced by the San Diego County Water Authority, that is, roughly, the western half of the Region. The City of San Diego, the largest population center, as of January 1965 had a population of nearly 645,000. By 1990, the population in the San Diego Region is expected to be more than 2,000,000.

Although the total water service area is now almost equally divided between agricultural and urban-suburban lands, the Region -- especially in the coastal portions -- is rapidly becoming predominantly urban-suburban.

Between 1948 and 1958, the increase in urban-suburban lands was 74 percent, or about three times as great as the percentage increase experienced in irrigated agriculture. This tremendous growth is most apparent in the densely populated San Diego metropolitan area and the less populous but also



POPULATION IN SAN DIEGO REGION

FIGURE 2

rapidly growing communities, such as Escondido, Oceanside, Carlsbad, Fallbrook, Laguna Beach, San Juan Capistrano, Ramona, San Clemente and others.

Major economic endeavors in the area are the aerospace and aircraft industries and ocean fishing. In addition, the headquarters of the U. S. 11th Naval District, with its vast facilities, is in the San Diego metropolitan area. Camp Pendleton, the largest U. S. Marine Corps base in the nation, is near Oceanside.

A center of tourist attractions and a mecca for retired persons, the Region serves as a gateway to Mexico through Tijuana, Baja California.

Mining

Mineral deposits are widespread, and mining activity has been economically important since gold was discovered near Julian in 1869. Prior to this, Indians and early-day Spanish and Mexican inhabitants are said to have recovered small amounts of gold from deposits southeast of what is now Escondido. In the late 1700's and early 1800's, some noncommercial mining was done by the early Spanish settlers. They used stone and adobe for construction of buildings, walls, and small dams. Important commodities produced in former years include gold (mainly 1870-75 and 1887-1900); gem minerals, especially tourmaline and kunzite (mainly 1900-12); feldspar (1918-43); and lithium mica (1892-1928). Important commodities produced in recent years are dimension stone, salt, magnesium chloride, clay, pyrophyllite, and specialty sands. At present, the principal commodities mined are sand and gravel along with crushed and broken stone (Weber, 1963).

PRESENTATION IN REPORT

For this study, the San Diego Region (drainage province) was divided into 11 hydrologic units and 54 hydrologic subunits with boundaries shown on Plate 1. The boundaries are identical with those in DWR report, "Names and Areal Code Numbers of Hydrologic Areas in the Southern District", which was published in April 1964.

More than 100 ground water basins have been delineated in the Region; many of these have been described in previous reports. Hydrologic units investigated during this study are designated by the code and name shown on Plate 1. They are discussed in Chapter VI according to their numerical sequence within the San Diego Region.

1917

San Diego

1963

From the Historical Collection
of Title Insurance and Trust Company
San Diego, California

A rate of growth which exceeded that of either the State or the nation.

The report first presents an overall picture of the geologic, water supply, and water quality conditions in the San Diego Region and then concludes with a detailed account of conditions within the individual hydrologic units and subunits.

Emphasis is placed on the use of illustrative material to present the interpretative data in this report.

FINDINGS

The findings of this investigation may be summarized as follows:

1. The three influences on the chemical quality of water resources in an area -- geologic environment, hydrologic environment, and activities of man -- are closely interrelated in their effects upon the water resources of the San Diego Region (an area which extends approximately 45 miles inland from the coast and southerly from the drainage divide near Laguna Beach to the California-Mexican Boundary).

For example, the general deficiency of precipitation and consequent reduced runoff over the past 20 years and the limited size of the ground water reservoirs, coupled with an accelerated population growth, have resulted, to a large degree, in depleting the water resources of much of the Region. Consequently, overdraft conditions developing in some of the major alluvium-filled coastal valleys have resulted in sea-water intrusion and connate water invasion which have impaired the chemical quality of the native ground water. This depletion and impairment have been directly reflected in the increased requirements for importation of Colorado River water. Although, for the Region as a whole, this imported water constitutes approximately 80 percent of the supply, some areas are entirely dependent upon local ground and surface water sources.

2. The principal factors within the geologic environment that have influenced the constituents dissolved in surface and ground water are the chemical composition of the rocks and the weathering processes which these rocks undergo and, to a lesser degree, the natural discharge of hot springs.

3. The chemical quality of water in the San Diego Region has been modified to varying degrees as a result of man's activities. These include importation of Colorado River water, use of reclaimed waste water and desalinized water, intrusion of sea water, invasion by connates, development of adverse salt balance conditions, disposal of domestic and industrial

wastes, and application of chemical fertilizers. Future importation of Northern California water will also influence and ameliorate the chemical quality of these waters.

4. The principal water quality problems in the Region are the impairment of chemical quality of ground water in the alluvium-filled valleys in some of the coastal areas as a result of sea-water intrusion, connate water invasion, or both and the impairment of the water quality in some inland communities from waste water disposal practices and irrigation return.

5. The major rock types in the study area are alluvium, residuum, Pleistocene sediments -- principally the Pala Fanglomerate, Temecula Arkose, and Pauba Formation of continental origin; pre-Quaternary sediments -- largely the San Diego, Capistrano, San Mateo, and La Jolla Formations of marine origin and the Poway Conglomerate, largely of continental origin; and crystalline rocks -- principally tonalites, granodiorites, gabbros, and metamorphics. Of these, the crystalline rocks, which form the Southern California Batholith, are the largest single group. Residuum has developed in situ on these crystalline rocks. The alluvium and pre-Quaternary sediments are mainly located in the coastal plain section of the study area with the continental Pleistocene sediments occurring largely in the mountain-valley section of the Region.

6. Most of the readily extractable ground water is obtained from reservoirs consisting of alluvium and Pleistocene sediments, with lesser amounts from pre-Quaternary sediments, residuum, and fractured and jointed crystalline rocks.

7. The chemical quality of ground water from alluvium is highly variable, but generally where it is over-extracted in the coastal areas, it has a total dissolved solids (TDS) content exceeding 1,000 ppm and a sodium chloride character. Proceeding inland, the TDS usually decreases to less than 500 ppm, with a sodium to calcium bicarbonate character. Ground water extracted from the alluvium generally varies from marginal to inferior for domestic and irrigation uses in the coastal areas and suitable to marginal in the inland areas.

8. In general, ground water from the continental Pleistocene sediments has a TDS concentration falling within 200 to 600 ppm, a calcium to sodium bicarbonate chemical character, and is of suitable chemical quality for domestic and irrigation uses.

9. The pre-Quaternary sediments, which are largely marine in origin and in part water bearing, contain partially flushed

connate waters of varying chemical quality. These waters generally have a TDS concentration of 400 to 2,000 ppm, a sodium to calcium and bicarbonate to chloride chemical character, and are marginal to inferior for domestic and irrigation uses.

10. Ground water extracted from the fractured and jointed crystalline rocks generally has a TDS concentration that falls between 150 and 700 ppm, a calcium to sodium bicarbonate character, and a chemical quality suitable for domestic and irrigation uses. However, ground water extracted from residuum is generally much more variable in chemical quality.

11. In the San Diego Region, the four major cations normally found in natural water, in general order of decreasing abundance are: calcium, sodium, magnesium, and potassium. They are derived from the principal chemical constituents of the crystalline rocks -- oxides of silicon, aluminum, iron (relatively insoluble), calcium, magnesium, sodium, and potassium.

12. Although potassium is present in most of the crystalline rocks, its concentration in surface and ground water is negligible. This results from the adsorption of potassium by clayey materials and from other complex physicochemical processes.

13. If the chemical analysis of a specific crystalline rock type is known and if the conversion technique presented in this study is used, it is possible to estimate the cation chemical character of the water that comes into contact with that rock type.

CONCLUSIONS

Based on the findings of this study, the following conclusions may be drawn:

1. Because of the depletion of local water supplies and the impairment of their chemical quality, many parts of the San Diego Region are in need of supplemental supplies, such as imported Northern California water, desalinized water, and reclaimed waste water. These supplemental waters could be used to recharge ground water reservoirs. Ground water replenishment would improve the chemical quality of the local ground waters by flushing out encroaching connate and sea waters.

2. The interrelationships evaluated in this study between the geologic and hydrologic environments and the activities

of man on the one hand and chemical quality of the water on the other hand proved a valuable tool in this investigation, and should be applicable in other areas. Utilizing this method, the evolution of the water quality in the study area was ascertained. This technique also can be used to predict future trends in water quality.

CHAPTER II. GEOLOGY

This chapter presents a discussion of the general geology of the San Diego Region. Detailed discussions of those geologic features which significantly affect the hydrology and water quality of the hydrologic units and subunits are presented in Chapter VI.

Investigation of the geology included a study of the various rock types and their distribution and the effects of the chemical properties of these rocks on water quality. These facets are discussed in detail in Chapter V.

The major water-bearing rock types are the unconsolidated to semiconsolidated sediments and, to a lesser degree, the consolidated sediments, residuum, and fractured crystalline rocks.

Field mapping of the major water-producing areas in the San Diego Region was done by Department of Water Resources personnel. This information was integrated with geologic maps of consolidated sediments and crystalline rocks compiled and/or mapped by the California Division of Mines and Geology (1962 and 1966), and modified where necessary.

Reports by Ellis and Lee (1919), and Larsen, Everhar, and Merriam (1951), and Weber (1963) cover major portions of the Region.

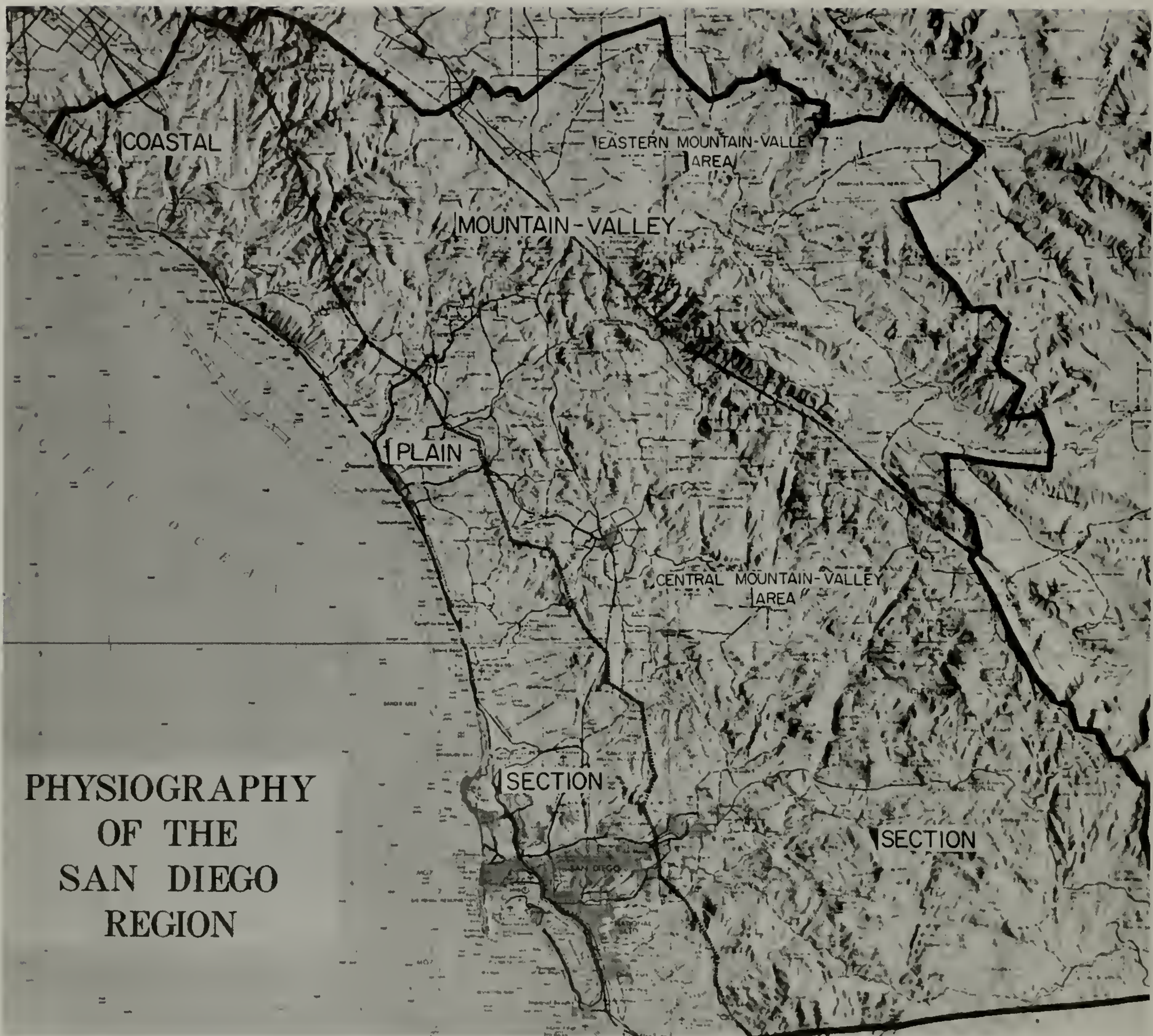
The aspects of geology which are discussed in this chapter are geologic history, physiography, soil characteristics, geologic rock types, and structural geology. Selected references are presented in Appendix A and a list of definitions is presented in Appendix B.

GEOLOGIC HISTORY

Data utilized to interpret the sequence of events which occurred in the San Diego Region were largely obtained from Bulletin 170 of California Division of Mines (1954). The significant events that form the history are described here in chronological order from oldest to youngest.

1. Originally, the Region was part of a vast area composed of pre-batholithic rocks. These rocks were subsequently subjected to tectonic forces which resulted in their folding, faulting, and metamorphism.

2. A magmatic body (the Southern California Batholith), probably related in part to the above-mentioned metamorphic



U. S. Army Map Service
Corps of Engineers

The Region may be divided from west to east into two major sections--a coastal plain section and a dissected mountain-valley section.

activity, was emplaced during the beginning of late Cretaceous time. From this body, many separate injections occurred along zones of structural weakness. Many of the existing rocks were intruded and assimilated by encroaching magmatic material and now occur as roof pendants or inclusions of hybrid gneisses and schists within the batholith. Contact metamorphism occurred between the molten material and country rock, allowing recrystallization and formation of new materials. As a result of magmatic differentiation, the composition of the molten mass changed during the cooling process, resulting in the formation of gabbros, then tonalties, and finally granodiorites.

3. After emplacement of the batholith, uplift occurred, allowing most of the overlying rocks to be removed by erosion. The erosion continued until the area was one of low relief and it was deeply weathered.

4. The materials that had been eroded were deposited along the sea margins. Sedimentation also occurred during late Cretaceous time, but subsequent erosion has removed much of this evidence.

5. The Tertiary Period began with deposition of more sediments on a land surface of low relief. During Paleocene time, the northern portion of the Region was subjected to fluctuating seas. In Eocene time, sea level was stabilized and, consequently, marine sediments were deposited.

6. In late Eocene time, regional uplift resulted in erosion and, as relief of this land surface was reduced, a thick deposition of continental sediments occurred.

7. Oligocene and Miocene times seem to have been ones of uplift and tilting in the major part of the Region, except in the northern coastal portion.

8. As the Los Angeles Basin was submerged in middle Miocene time, thick marine beds were deposited, which overlapped the northwestern coastal portion of the San Diego Region. During Miocene time, a breccia, containing rock fragments similar to those now found on Santa Catalina Island, was deposited along the northern coastal portion of the San Diego Region. Because of the similarity between the breccia and rocks on Santa Catalina Island, the breccia was probably derived from a major land mass to the west which now is no longer in existence.

9. Sedimentation in Pliocene time appears to have been discontinuous along the coast and to have taken place in shallow marine embayments, as in the southwestern coastal part, where clastic sediments were deposited.

10. During Pleistocene time, the sea receded from the continent in the glacial periods and returned in the interstages, with clastic marine beds being deposited along much of the coast. These fluctuations in sea level had a marked effect on coastal topography, and many terraces were formed by a combination of wave erosion and deposition.

11. Mid-Pleistocene time was a period of intensive regional diastrophism in which major movements occurred along faults. These movements resulted in the breakup of highland erosion surfaces into major blocks lying at different elevations. A subsequent rise in sea level at the end of the Pleistocene led to the backfilling of coastal river channels with thick deposits of alluvium.

12. During Recent geologic time, crystalline materials have been weathering to form residuum, highland areas have been eroding, and, locally, deposition of river, lake, and beach sediments has been continuing.

PHYSIOGRAPHY

The area of investigation lies within the Peninsular Range Province, one of 11 geomorphic or physiographic provinces of the State of California. This geomorphic province is developed on an extensive uplifted fault block that occupies the southwestern portion of California and extends southward into Baja California, Mexico. The portion of the geomorphic province in the San Diego Region is approximately 80 miles in length and averages 45 miles in width. An additional part of the province, whose surface expression is prominently represented by Santa Catalina, Santa Barbara, San Nicolas, and San Clemente Islands, lies submerged beneath the Pacific Ocean.

The San Diego Region as a whole presents an asymmetric transverse profile having a long, gentle western slope and a steeper eastern slope. Highlands are present toward the east and the topography becomes less rugged toward the west and southwest. On the east, the Region is separated in part from the Colorado Desert by spectacular scarps ranging from 3,000 to 6,000 feet in height. Most of the scarps, which are displayed en echelon, mark the nearly parallel traces of major zones of faulting. Flanking the western slopes of the mountains is an irregular belt of sedimentary rocks cut by wave erosion and subsequently veneered with marine and nonmarine deposits to form a series of terraces and mesas along the coast.

The San Diego Region may be divided from west to east into two major sections: (1) a coastal plain section characterized by prominent marine wave-cut terraces, locally interrupted by

Looking Toward North Bank of Bed of San Diego River, November 1960

Giant Photo Service

The coastal plain section is characterized by a series of dissected wave-cut terraces, which have been modified by erosion.

stream channels conveying water from the eastern highlands to the Pacific Ocean; and (2) a dissected mountain-valley section which can be further subdivided into a central mountain-valley area and an eastern mountain-valley area.

Coastal Plain Section

The coastal plain section, which is underlain by Tertiary marine sediments with a relatively thin cover of Quaternary deposits, is characterized by a series of dissected wave-cut terraces which extend inland from the coast for about 10 miles.

In the vicinity of Oceanside and San Diego is a series of terraces that have been formed on gently dipping sediments of Cretaceous, Eocene, Pliocene, and Pleistocene age. These terraces range from near sea level to about 1,200 feet in elevation. Many of the surface features of these terraces have been modified or destroyed by extensive erosion.

The coastal plain section has been dissected by various rivers which have formed a series of wide, flat-bottomed alluvium-filled valleys that provide important ground water reservoirs. Among the larger are the San Juan, Santa Margarita, San Luis Rey, San Dieguito, San Diego, Sweetwater, Otay, and Tia Juana Valleys.

The apparent closure, or necking, of the mouth of several of these valleys may be caused by: (1) differential erosion, for example, near the mouth of the San Luis Rey River a more resistant formation (the San Onofre Breccia) occurs downstream from less resistant sediments (the La Jolla Formation); (2) deposition of stream-carried materials, which have been accentuated by the formation of baymouth bars and, in part, by development of various other features (for example, Batiquitos Lagoon); and (3) a combination of both, as at the mouth of the San Dieguito River.

Mountain-Valley Section

The mountain-valley section, which is characterized by mountains and intermontane basins, makes up approximately two-thirds of the San Diego Region and is subdivided on the basis of topographical differences into a central mountain-valley area and an eastern mountain-valley area.

The central mountain-valley area is bounded by the coastal plain section on the west and by the Elsinore fault zone and the drainage divide of the San Diego Region on the east. The

Escondido and Vicinity, 1962 California Division of Highways

A broad intermontane valley at an elevation of about 700 feet.

smaller area of the two, the eastern mountain-valley area, is bounded by the Elsinore fault zone on the west and, in part, by the San Jacinto fault zone and the drainage divide of the San Diego Region on the east.

Central Mountain-Valley Area

Elevations of the higher peaks of this area range from 5,687 feet at Santiago Peak, the northernmost extension of the Region, to 6,515 feet at Cuyamaca Peak, and 6,375 feet at Mount Laguna in the southeastern portion of the Region.

The floors of alluvium-filled valleys range from about 500 to 5,000 feet in elevation in a general steplike arrangement of alternating narrow and broad valleys. These valleys, which are prominent in the southeastern portion of the Region, are probably due to multiple erosion cycles. In addition, several larger broad intermontane basins owe their configuration to structural control and erosion of the crystalline rocks.

The intermontane basins are generally underlain by at least 100 feet of residuum which may be covered in part by a relatively thin cover of alluvial sediments. Examples of these valleys are: (1) Ramona at an elevation of about 1,500 feet; (2) Escondido at about 700 feet; and (3) El Cajon at about 500 feet.

Another characteristic of these intermontane basins is that they have been bypassed by the present major westerly-flowing

Felsenmeer on Mount Woodson, November 1954 — Mel Forbes, Palomar Pictures

A sea of rocks developed on Mount Woodson Granodiorite near Ramona.

stream systems. The erosion cycles which have developed the Recent alluvial valleys have modified the older intermontane basins. As a result of diastrophism during the late Cenozoic Era, stream piracy took place and several of the older southward-draining stream systems were captured by younger westward flowing streams. Examples of this stream piracy are the San Diego River near El Capitan and the Sweetwater River near Descanso.

Major plateau-like erosional surfaces are well developed in the central mountain-valley area. These surfaces are usually underlain by thick residuum and may show development of a sea of rocks or felsenmeer (boulder field). Regional peneplanation, tilting, and faulting have accounted for the apparent stairstep arrangement of the eroded surfaces. Successively lower surfaces, such as those in the vicinity of Ramona, Valley Center, Fallbrook, and Escondido, have been deeply weathered.

In the southeastern portion of the Region, the highest plateau, which occurs in the vicinity of Laguna Mountain, ranges from about 5,000 to 6,000 feet in elevation. A lower plateau, ranging in elevation from about 3,500 to 5,000 feet, surrounds the higher plateau and extends east from the Campo area northwesterly to the Lake Henshaw area. However, between the Santa Ysabel and Lake Henshaw areas, the lower plateau is interrupted by lowlands.

Westerly and somewhat parallel to this lower plateau is a dissected surface of about 2,500 to 3,500 feet in elevation.

A similar dissected plateau occurs to the north in the Santa Margarita and Santa Ana Mountains, and to the south lies a graben-like structure between De Luz and Escondido.

Eastern Mountain-Valley Area

Beyond the eastern limits of the central mountain-valley area, physiography changes quite markedly.

This area is distinguished from that previously described by marked structural control resulting from parallel and block faulting. In addition, its valleys are broader and flatter. Furthermore, thick continental deposits are developed in grabens, as in the vicinity of Temecula and Murrieta, where the graben floor is covered with Temecula Arkose and lesser amounts of other continental sediments. The tonalites of the eastern mountain-valley area have weathered and eroded to form felsenmeers similar to those in the central mountain-valley area.

The southern portion of the eastern mountain-valley area is generally higher than the northern portion, with mountains ranging from about 5,600 feet to 6,800 feet in elevation. These mountains rise from a plateau of approximately 3,000 feet elevation. A portion of the area, located northwest of a line drawn through Red Mountain and Oak Mountain, is generally lower in elevation than is the southeast portion. It is probably a graben area. This rolling plateau generally ranges from about 1,500 to 2,500 feet in elevation, with Bachelor Mountain reaching an elevation of 2,555 feet; Oak Mountain, 2,643 feet; and Black Mountain, 3,033 feet. West of this plateau, the Elsinore, Murrieta, and Temecula areas lie in a northwest trending graben at about 1,300 feet in elevation.

SOIL CHARACTERISTICS

In this report, the soils of the San Diego Region are assigned to three major groups, depending upon the materials from which they were formed and the processes by which they were derived. These groups are recent alluvial, residual, and coastal plain and old valley fill soils (Holmes and Pendleton, 1918). Because of the prevailing mountainous character of the Region, the soils of the residual group are the most extensive of the three. In addition, another group of miscellaneous materials, classified as rough stony land, forms the largest surface area.

The recent alluvial soils, which consist of materials laid down by comparatively recent stream activities, occur on alluvial fans, in enclosed mountain flats, or as bottom land, in the floors of valleys. They have not undergone the aging processes that have modified the coastal plain and old valley fill soils. The major soil series are the Foster, Hanford, Yolo, and Dublin, with the first two being common in the inland valleys and the second two common to the coastal valleys.

The residual soils have been derived in place through the weathering of the underlying rock material. They occur almost entirely in the mountain-valley section of the Region. These soils consist mainly of the Sierra and Holland soil series.

The coastal plain and old valley fill soils have been derived through the weathering and modification of old unconsolidated waterlaid (generally marine) deposits. They are associated with the coastal plain or with the high terraces and older, often elevated valley floors which sometimes border the streams or valleys. They are made up largely of the Montezuma, Redding, and Kimball soil series.

In general, the soil designations agree with the geologic rock types as presented in this report. The recent alluvial soils are characteristic of areas mapped as alluvium, but also include some Pleistocene sediments. Residual soils are characteristic of areas mapped as residuum and are generally developed on the crystalline rocks. Coastal plain and old valley fill soils are characteristic of areas largely mapped as pre-Quaternary sediments. They also include some Pleistocene sediments. The area classified as rough stony land is characteristic of the mountainous areas where metamorphic rocks and intrusives of the Southern California Batholith are exposed.

GEOLOGIC ROCK TYPES

The various lithologic materials were grouped for this study into five major rock types on the basis of lithologic similarity, water-bearing properties (discussed in Chapter III), geologic age, and area of occurrence (Plates 2A, 2B, 2C, 3A, 3B, and 3C). Table 1 summarizes these rock types and relates them to names used in previous reports. The descriptions of the rock types in the text and in Table 1, in general, are presented from youngest to oldest in age.

Alluvium

Alluvium (Qal) of Recent age generally consists of unconsolidated deposits of gravel, sand, silt, and clay eroded from the surrounding highlands. Alluvial deposits attain their greatest thickness (about 200 feet) in the coastal and larger inland valleys. In the youthful V-shaped valleys and in the broad flat intermontane areas, the alluvium is relatively thin. Lines of equal thickness of valley fill in selected areas are shown on Plates 4A, 4B, and 4C.

For this study, beach and dune sand deposits have been included in alluvium. Along the ocean, low-lying coastal beach and dune sand deposits occur as elongate dune ridges, parallel to the coast. They are less important as reservoirs of ground water than other deposits because they generally occur above the water table. Reddish-brown ironstone concretions are scattered over the surface of some of the more prominent ridges.

Residuum

Residuum (Qr), a product of weathering in situ, is found throughout much of the San Diego Region. Most of the crystalline rocks in the Region are highly susceptible to

TABLE 1

LITHOLOGIC CORRELATIONS IN THE SAN DIEGO REGION

Name and symbol in this report		Name in previous reports	Geologic age	Maximum thickness, in feet	Description	Distribution in hydrologic units
Alluvium	Qal	Alluvium	Recent	200	River, stream, and lake deposits. Gravel, sand, silt, and clay.	1 to 11
	Qal	Dune sand	Recent	--	Coastal dune sand and beach deposits	1 to 11
		UNCONFORMITY				
Residuum	Qr	Residuum, decomposed granite, and grus	Recent, in part post-Cretaceous	300	Residual soils, lateritic soils, decomposed granitic rocks, and grus. Frequently covered by thin alluvial deposits. Weathered in situ from igneous and metamorphic rocks.	1 to 7, 9 to 11
		UNCONFORMITY				
Pleistocene sediments	Qp_4	Older alluvium, river terrace, and unnamed continental deposits	Pleistocene	200	Nonmarine gravel, sand, and silt. Partially cemented and weathered.	1 to 7, 9 to 11
	Qp_3	Pala Fanglomerate and unnamed fanglomerates	Pleistocene	400	Continental, subangular boulder deposits, derived from igneous and metamorphic rocks.	2, 3, 5
	Qp_2	Pauba and Dripping Spring Formations	Pleistocene	500	Continental fanglomerate, sand, silt, and clay deposits. May be cemented by iron oxide.	2
	Qp_2	Temeculá Arkose	Pleistocene	2,000	Continental arkosic sand with silicified marl, tuff, silt, and calcareous concretions.	2, 3
	Qp_1	Linda Vista Formation	Pleistocene	100	Marine (in part nonmarine) sandstone, siltstone, and conglomerate with abundant iron oxide concretions.	6 to 11
	Qp_1	Bay Point Formation	Pleistocene	50	Marine sandstone, coquina, siltstone, and conglomerate.	6 to 11
	Qp_1	Sweitzer Formation	Pleistocene	50	Largely nonmarine sandstone, siltstone, and conglomerate, cemented with iron oxide.	6 to 11
	Qp_1	Unnamed marine deposits	Pleistocene	300	Marine sandstone, siltstone, and conglomerate; locally has nonmarine sedimentary cover.	1 to 11
		UNCONFORMITY				
Pre-Quaternary sediments, and volcanic rocks	Tk	Volcanic rocks	Pliocene	100	Olivine basalt flow	1 to 3
	Tk	Niguel Formation	Pliocene	--	Marine (upper part may be nonmarine) siltstone and sandstone, locally conglomerate.	1
	Tk	Repetto Formation	Pliocene	--	Marine sandy siltstone with minor amount of conglomerate.	1
	Tk_7	San Diego Formation	Pliocene	1,400	Marine sandstone, siltstone, and conglomerate with tuff beds.	8 to 11
	Tk_6	San Mateo Formation	Pliocene	150	Marine sandstone and conglomerate.	1

LITHOLOGIC CORRELATIONS IN THE SAN DIEGO REGION
(continued)

Name and symbol in this report		Name in previous reports	Geologic age	Maximum thickness, in feet	Description	Distribution in hydrologic units
Pre-Quaternary sediments, and volcanic rocks	Tk_6	Capistrano Formation	Miocene	1,200	Marine shale, siltstone, and sandstone.	1
	Tk_5	Monterey Formation	Miocene	500	Marine siliceous shale and siltstone, sandstone, local tuff, and conglomerate.	1
	Tk_5	San Onofre Breccia	Miocene	2,600	Marine schist breccia, with lenses of sandstone, siltstone, and some conglomerate.	1 to 4
	Tk_5	Topanga Formation	Miocene	--	Marine conglomerate, sandstone, siltstone and tuff.	1
	Tk_5	Vaqueros Formation	Miocene	2,500	Marine siltstone and sandstone.	1
	Tk_5	Sespe Formation	Miocene to Eocene	--	Continental clayey sandstone, grit conglomerate, and sandy clay.	1
	Tk_5	Santiago Formation	Eocene	--	Marine sandstone, conglomerate, and siltstone.	1
	Tk_4	Ballena Gravels	Eocene	--	Continental conglomerate, possibly equivalent to the Poway conglomerate.	5 to 7, 9
	Tk_4	Poway Conglomerate	Eocene	1,000	Continental and in part marine conglomerate overlain by sandstone and underlain by sandstone and mudstone.	5 to 8
	Tk_3	La Jolla Formation:				1 to 6
		Rose Canyon Shale	Eocene	1,200	Marine mudstone, siltstone, shale, sandstone, and conglomerate with a few thin limestone beds.	
		Torrey Sand	Eocene	200	Marine sandstone, coarse and poorly consolidated.	
		Delmar Sand	Eocene	250	Massive marine mudstone, siltstone, shale, and sandstone.	
	Tk_2	Martinez Formation	Paleocene	300	Arkosic sandstone and conglomerate	1, 2
	Tk_2	Silverado Formation	Paleocene	--	Marine (partly nonmarine) conglomerate, clay, sandstone, and grit.	1
	Tk_1	Chico or Rosario Formation	Cretaceous	2,000	Marine sandstone, siltstone, and conglomerate.	1, 4, 6, 8
	Tk_1	Trabuco Formation	Cretaceous	1,000	Continental conglomerate and sandstone.	1
		UNCONFORMITY				
Crystalline rocks. Granodiorites	Kgr	Stonewall Granodiorite, undifferentiated granodiorites, and leucogranodiorites	Late Cretaceous	--	Light colored; weathers to light brown residuum	2 to 7, 9, 11
	Kgr_1	Woodson Mountain Granodiorite	Late Cretaceous	--	Light colored; weathers along joints resulting in broad felsenmeer of rounded core stones.	1 to 7, 9 to 11
Tonalites	Kto	Aguanga Tonalite, undifferentiated tonalites, and quartz diorites	Late Cretaceous	--	Light gray color; weathers to residuum and broad felsenmeer.	2, 3

LITHOLOGIC CORRELATIONS IN THE SAN DIEGO REGION
(continued)

Name and symbol in this report		Name in previous reports	Geologic age	Maximum thickness, in feet	Description	Distribution in hydrologic units
Crystalline rocks Tonalites	Kto_3	Bonsall Tonalite	Late Cretaceous	--	Light to dark gray, characterized by abundant dark inclusions; weathers deeply to thick reddish-brown residuum; often leaves felsenmeer of light brown core stones.	1 to 5, 7, 9 to 11
	Kto_2	Lakeview Mountain Tonalite and/or La Posta Quartz Diorite	Late Cretaceous	--	Light colored, relatively unweathered exposures in road cuts; weathers to light colored arkosic residuum forming broad felsenmeer.	2, 3, 5, 7, 11
	Kto_1	Green Valley Tonalite	Late Cretaceous	--	Dark gray; weathers deeply leaving deep reddish-brown residuum and sometimes felsenmeer.	1, 4 to 7, 9 to 11
Gabbros and diorites	Kbi	San Marcos Gabbro, Cuyamaca Gabbro, Viejas Diorite, and undifferentiated gabbros and diorites	Late Cretaceous	--	Dark gray to black; weathers deeply to form dark reddish-brown residuum with isolated core stones. Gabbro known as "black granite".	1 to 7, 9 to 11
Metamorphic rocks	M_3	Hybrid and undifferentiated metamorphic rocks	Pre-Late Cretaceous	--	Recrystallized gneissic and mixed rocks of prebatholithic and batholithic origin.	2, 3, 5 to 7 9, 11
	M_2	Santiago Peak Volcanics, Black Mountain Volcanics, and Alisitos Formation	Cretaceous and/or Jurassic (?)	15,000	Metamorphosed to partially metamorphosed lava flows and tuff breccia of andesite, dacite, and rhyolite; tuffaceous sandstone, shale, quartzite, and conglomerate.	1 to 11
	M_2	Bedford Canyon Formation	Triassic and/or Jurassic	20,000	Slightly metamorphosed siliceous siltstone and slate, interbedded with graywacke, sandstone, breccia conglomerate, and quartzite.	1 to 6
	M_1	Julian Schist	Pre-Cretaceous	12,000	Quartz mica schist and quartzite. Weathers to dark reddish-brown residuum.	7, 9, 11

various degrees of weathering. Where these rocks have been sufficiently weathered, the surface is underlain by residuum, commonly referred to as decomposed granite (D. G.) or grus.

The intrusive rocks, especially tonalites, weather to a well developed residual soil profile that exhibits a zonal development in the San Diego Region. According to Ruxton and Berry (1957), the granites in Hong Kong have developed a weathered profile showing four zones of development.

In the San Diego Region, the intrusive and metamorphic rocks weather to a reddish-brown residuum. In weathering, the ferromagnesian minerals (biotite and hornblende) decompose first, followed by the feldspars (plagioclase and orthoclase). When orthoclase begins to decompose, the rock containing it breaks into granular fragments called grus. Grus, because of its granular nature, is used for borrow material. With continued weathering, the ferromagnesian minerals and feldspars are almost completely decomposed to clay minerals. The grus then becomes a dark red-brown, sandy argillite or lateritic residuum.

Spheroidal weathering or exfoliation of intrusive rocks produces the most noticeable weathering remnants. Chemical and mechanical action penetrating inward from the surface results in the formation of "core stones" surrounded by matrix of residuum. As this residuum is removed, the core stones collect on the surface as a felsenmeer.

Weathering (decomposition and disintegration) is most advanced at the ground surface where the rocks have been completely reduced to small particles. The degree of weathering decreases downward to solid rock at depths generally less than 100 feet, but in some areas more than 200 feet (Plates 3A, 3B, and 3C).

The parent materials for residuum are the crystalline rocks (tonalites, gabbros, granodiorites, and metamorphic rocks). Residuum is generally most extensively developed in the tonalite and gabbro terranes because they contain a higher percentage of ferromagnesian minerals. Moreover, the tonalites usually contain many inclusions of older rocks which increase their susceptibility to weathering.

On the other hand, the granodiorites are more resistant to weathering. This is indicated by the fact that the felsenmeer or boulder fields are more prominent in the granodiorites than they are in the tonalites and gabbros which, as pointed out previously, may develop a more extensive residuum cover.

Residuum is considered as being of Quaternary age in this report. However, at Alberhill near Lake Elsinore reddish residuum formed on the crystalline and metamorphic rocks is overlain by Paleocene clayey sediments. Therefore, it is assumed that residuum has also formed prior to Paleocene time in the San Diego Region.

The permeability of the residuum is considered to be low to moderate. Although the yield of wells in residuum is comparatively low, locally it is an important water-bearing material.

Nearly all the crystalline rock areas have at least a thin, in part discontinuous veneer of residuum. In many of the highland areas, the residuum lies generally above the water table and is not a significant contributor of ground water. Also, because of increasing cultural and agricultural development, many of the historic water-bearing areas have been dewatered.

Core Stones and Residuum

Although the yield of wells in residuum is comparatively low, locally it is an important water-bearing material.

Outcrops of Water-Bearing

Pala Fanglomerate

These semiconsolidated, continental sediments are important sources of ground water and are tapped by many wells.

Temecula Arkose

Some of the wells extracting ground water from the Temecula Arkose produce in excess of 1,500 gallons per minute.

Rocks

(See also page 32)

San Diego Formation

Although this formation is considered to be only of low-to-moderate permeability, numerous water wells tap it as a source of supply.

Pleistocene Sediments

Pleistocene sediments (Qp_{1-4}) consist of a variety of materials. These include older alluvium in the coastal area, continental semiconsolidated fanglomerates in the Pala area, Temecula Arkose in the Temecula-Murrieta and Warner Springs area, and consolidated marine and, in part, nonmarine deposits (silts, sandstones, and conglomerates) in the coastal area (see Table 1).

The older alluvium (Qp_4), which is locally extensive, attains a maximum thickness of 200 feet. It is a complex of clay, silt, sand, and gravel, which in part is overlain by alluvium of Recent age. Its brown to reddish-brown color indicates the degree of weathering and cementation by iron oxides. Older alluvium is frequently exposed as erosional remnants in stream-cut terraces along the sides of valleys.

The semiconsolidated, continental Pala fanglomerate (Qp_3) outcropping in the Pala-Pauma area has a maximum thickness of 400 feet. The Pauba and Dripping Spring Formations (Qp_2), which occur in the Temecula-Aguanga area, are generally less than 500 feet thick. The Temecula Arkose (Qp_2), generally less than 2,000 feet thick, crops out in the Temecula-Murrieta and Warner Springs areas. These Pleistocene sediments consist of clays, silts, sands, gravels, and minor calcareous deposits.

The Linda Vista Formation (Qp_1), Bay Point Formation (Qp_1), and related unnamed marine and, in part, nonmarine deposits consist of sandstones, siltstones, and conglomerates. These largely consolidated deposits, which occur in the coastal plain, are generally less than 300 feet thick. They have been subject to several periods of marine deposition and marine wave erosion during the Pleistocene Epoch as evidenced by a series of coastal terraces. The terraces extend inland as much as 8 miles in the vicinity of the City of San Diego, narrowing to less than 1 mile in the vicinity of Laguna Beach.

Pre-Quaternary Sediments and Volcanic Rocks

The pre-Quaternary sediments and volcanic rocks (TK_{1-7}) consist of many lithologic formations, varying from the Pliocene San Diego Formation to the Cretaceous Trabuco Formation (Table 1).

This unit, although largely confined to the area 7 to 12 miles from the coast, extends 20 miles inland from La Jolla to the vicinity of San Vicente Reservoir. Tertiary marine sediments, Eocene to Pliocene in age, are the predominant rocks occurring in this unit. They include siltstone, sandstone, conglomerate, shale, mudstone, and breccia.

These sediments attain a maximum thickness of 2,500 feet or more in the Miocene San Onofre Breccia and Vaqueros Formation. Other major formations, with comparable thicknesses, are the San Diego (1,400 feet), Capistrano (1,200 feet), Poway Conglomerate (1,000 feet), La Jolla (1,650 feet), Chico or Rosario (2,000 feet), and Trabuco (1,000 feet).

The Pliocene San Diego Formation (TK_7), exposed largely south of the San Diego River, is principally marine in origin. This formation, which underlies or caps the mesa areas, consists of sandstone, siltstone, and conglomerate, along with some volcanic tuff beds, all of which vary in thickness. Very coarse-grained sands and well-bedded cobbles and boulders are found at the base of some sections. Although this formation is considered to be only of low-to-moderate permeability, water wells penetrate it to depths of more than 1,000 feet.

The marine Miocene (in part, early Pliocene) Capistrano and San Mateo Formations (TK_6), exposed in the northwestern portion of the Region, consist largely of sandstone, siltstone, and shale, along with some gypsiferous deposits. Northwest of Arroyo Trabuco Creek, the sediments grade laterally into a white massive sandstone. Near the mouth of San Mateo Creek, the Capistrano Formation is masked by 40 to 80 feet of Recent alluvium. The finer sediments are relatively impermeable and generally nonwater-bearing, whereas the coarser sediments may locally be water-bearing.

The San Onofre Breccia (TK_5) of Miocene age consists of a well-cemented schist breccia with lenses of sandstone, siltstone, and some conglomerate. This resistant formation is exposed in the northern coastal portion of the San Diego Region as an elongated band averaging 2 miles in width. Although the San Onofre Breccia is considered to be relatively impermeable and not capable of transmitting appreciable amounts of water, small flows are obtained from springs.

Other significant Miocene sediments are the Monterey, Topanga, and Vaqueros Formations (TK_5), all of which occur in the northwestern portion of the study area. These formations, marine in origin, consist largely of sandstone, siltstone, conglomerate, tuff, and shale, possibly intercalated with gypsiferous beds. These sediments are generally impermeable and essentially nonwater-bearing, although locally water might be obtained from the coarser phases. Several dry holes have been drilled to depths of between 600 and more than 1,000 feet in the Monterey Formation.

The Eocene Poway Conglomerate (TK_4), about 1,000 feet in maximum thickness, occurs largely in the central to southern coastal portion of the San Diego Region and overlies the

Poway Conglomerate

Some production is obtained from the Poway Conglomerate, but yields from wells have been highly variable.

La Jolla Formation

The La Jolla Formation has been drilled extensively, although amounts of water produced have been generally small to moderate.

La Jolla Formation. To the east, the Ballena Gravels (TK_4), possibly correlated with the Poway Conglomerate, occur as erosional remnants of old river gravels overlying the crystalline rocks. This conglomerate, mostly of continental origin, is composed of pebbles and boulders largely from volcanic rocks. The conglomerate facies changes in thickness and in places it is overlain and underlain by thick sections of mudstone and sandstone, in part marine in origin.

The Eocene La Jolla Formation (TK_3), consisting of the Delmar Sand, Torrey Sand, and Rose Canyon Shale, occurs extensively in the coastal portion of the San Diego Region. It unconformably overlies the Cretaceous sediments and crystalline rocks. The lowest member, the Delmar Sand, is a multicolored sandstone with beds of sandy shale. The Torrey Sand, overlying the Delmar Sand, consists of a light to reddish-colored, clean, massive crossbedded sandstone. The Rose Canyon Shale (the upper member) is a gray to brown, thick series of mudstone, siltstone, sandstone, and conglomerate strata. Locally, it contains intercalated gypsum beds. The coarser sediments of the La Jolla Formation are moderately permeable and, where situated below the water table, may be water bearing.

The Cretaceous marine Chico or Rosario Formation (TK_1) is exposed in the Point Loma-La Jolla area, and it is exposed even more extensively along the inland coastal portion from San Onofre Creek to the Trabuco Canyon area where the nonmarine Trabuco Formation (TK_1) is also to be found. The basal member of these Cretaceous rocks is a reddish-brown conglomerate which is overlain by a series of interbedded sandstone, siltstone, and mudstone strata along with conglomerate beds.

Crystalline Rocks

The crystalline rocks underlie and are exposed throughout most of the San Diego Region. They include granodiorites, tonalites, gabbros and diorites, and metamorphic rocks.

Granodiorites

The granodiorites, of which the Woodson Mountain granodiorite (Kgr_1) is the most widespread, form a major portion of the Southern California Batholith. These crystalline rocks largely occur in a broad, discontinuous, irregular, northwest-trending strip from Tecate on the south to the Wildomar area on the north. The granodiorites, which are resistant to weathering, form some of the most prominent hills and mountains of the San Diego Region.

The granodiorites are generally lighter colored than the other major bodies of crystalline rocks. In general, they are massive, medium-to coarse-grained, light-gray granitic rocks which consist predominately of quartz, plagioclase, orthoclase, and biotite. Where nearly devoid of dark minerals, the granodioritic rocks are called leucogranodiorites.

These rocks weather and decompose to various depths and degrees; however, the residuum so formed is not as deep or extensive as that characteristic of the tonalites. As a result of weathering along the major joint planes, huge boulders up to 10 to 20 feet in diameter have been formed. In areas of low relief, scattered in situ boulders may rise above the soil to form a felsenmeer. On steeper slopes, the boulders are piled one on the other so as to resemble immense rockpiles.

Tonalites

The Bonsall (Kto_3), Lakeview Mountain (Kto_2), and Green Valley (Kto_1) Tonalites are the most widespread and prominent intrusives in the San Diego Region. They occur in the mountainous areas in wide, interrupted, discontinuous bands, from the southeast portion of the San Diego Region to its northernmost limit. Deeply weathered exposures of the tonalites underlie some of the relatively flat erosional surfaces and intermontane basins, such as the Fallbrook, Valley Center, and Escondido areas.

Tonalites are generally medium-grained, light gray rocks consisting essentially of plagioclase, quartz, hornblende, augite, and biotite. The Bonsall Tonalite differs from the other tonalites in that it contains abundant dark inclusions. The Green Valley Tonalite, much darker than the Bonsall Tonalite (because of a larger amount of mafic minerals), characteristically forms deeply weathered lowlands and hilly topography. On the other hand, the Lakeview Mountain Tonalite, which is lighter in color than the Bonsall Tonalite, forms mountains or plateaus covered with boulders and grus.

The tonalites characteristically weather to greater depths than do the other rock types, and in many areas form a residuum cover at least 100 feet thick. Disintegration occurs with a slight breakdown of the minerals and results in a friable grus matrix (decomposed granite). With more extensive weathering, further decomposition of the rock results in a reddish-brown lateritic, clayey mixture with resistant mineral grains.

Outcrops of tonalite are usually in the form of boulders of disintegration (core stones), which average several feet in

CORE STONES of Green Valley Tonalite atop hills above Escondido.

diameter. In road cuts, these boulders appear to be widely scattered within the grus. The felsenmeer formed by the tonalites is generally not as prominent or extensive as that developed from the granodiorites.

Gabbros and Diorites

This group (Kbi), which includes the San Marcos and Cuyamaca Gabbros, Viejas Diorite, and other similar undifferentiated basic intrusive rocks, occurs in places throughout much of the San Diego Region. The gabbros and diorites, generally in areas of 1 to 5 square miles, occur intimately with the older metamorphic rocks. These rocks occur as scattered remnants or roof pendants within the more extensive and younger intrusive bodies of granodiorite and tonalite.

Although the texture and mineral composition of these rocks vary, mountains underlain by them generally have a distinctive, broad-based, somewhat conical form. Their smooth slopes are covered with a deep reddish-brown residuum which supports a dense growth of brush. Outcrops are usually massive and form some of the more rugged mountains, as in the San Marcos and Pala areas, while less resistant exposures occur in areas of low relief.

These rocks, usually dark gray to black and fine- to medium-grained, consist of 60 to 70 percent plagioclase with variable amounts of hornblende, augite, hypersthene, and olivine.

Most gabbroic rocks weather readily, forming a deep reddish-brown lateritic residuum near the surface which becomes more granular with depth. Consequently, the residuum, which frequently extends to depths of 100 feet, may contain large, permeable, water-bearing zones. Locally, joints and fractures may also be water bearing.

Metamorphic Rocks

The metamorphic rocks (M_{1-3}) include hybrid (mixed) and undifferentiated rocks (M_3), the Santiago Peak (M_2) and Black Mountain Volcanics (M_2), the Bedford Canyon Formation (M_2), and the Julian Schist (M_1). These metamorphic rocks occur as two irregular, wide bands which roughly parallel the predominant northwesterly structural trend of the Peninsular Range geomorphic province. Of these two bands, which are largely separated by the intrusive rocks of the Southern California Batholith, the westernmost generally consists of mildly metamorphosed formations which are terminated by an onlap of Tertiary marine sediments. The highly metamorphosed rocks in the other band occur along the roof of the batholith as pendants or inclusions.

The hybrid and undifferentiated rocks, which consist largely of injection gneisses and associated intrusive rocks, are discontinuously exposed in the mountain-valley section of the Region. The most extensive outcrops occur in the area tributary to the headwaters of the San Diego River.

The Bedford Canyon Formation, containing metasedimentary rocks of Triassic and/or Jurassic age, occurs along the western flanks of the Southern California Batholith. These rocks consist largely of mildly metamorphosed argillites, slates, and feldspathic quartzites, which are unconformably overlain by metavolcanics of the Santiago Peak Volcanics and their southerly equivalent, the Black Mountain Volcanics. The metavolcanic rocks consist chiefly of agglomerates, breccia, tuffs, and flows that most commonly range from andesite to quartz latite with lesser amounts of interbedded clastic sedimentary rocks. This irregular belt of metavolcanic rocks generally occurs several miles inland of the coast in the southern area and extends northwesterly to the rugged mountains at Santiago Peak.

The Julian Schist, although not as extensive as the other metamorphic rocks, forms in the eastern part of the Region a prominent, narrow elongate, discontinuous band, which consists largely of a series of quartz-mica schists and quartzites. The Julian Schist occurs as a northwesterly trending irregular strip between the other crystalline rocks.

STRUCTURAL GEOLOGY

A complex system of nearly parallel faults trending northwest is the most prominent structural feature of the San Diego Region. Much of the topographic expression of the Region can be attributed to fault activity. The major faults in the

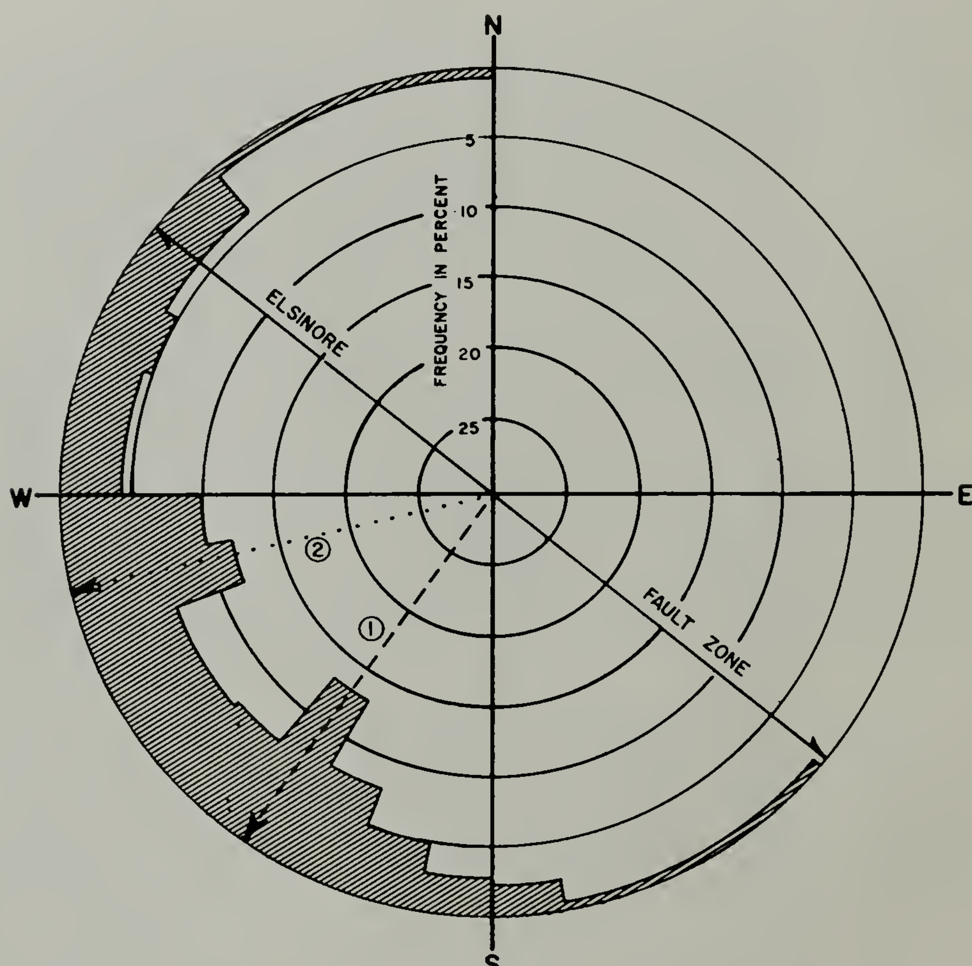
Region are the Elsinore, Agua Caliente, and San Jacinto fault zones (Plate 2A). The San Jacinto fault zone occurs in the northeasternmost part of the Region. The Elsinore fault zone extends through the Temecula-Murrieta area along the southwestern face of the Agua Tibia and Palomar Mountains. The Agua Caliente fault zone, which passes through Warner Springs, is one of the major parallel faults between the Elsinore and San Jacinto fault zones. Other major northwest trending parallel faults are the Aguanga and Hot Spring faults.

In the coastal region, the Christianitos fault extends south from Orange County into the San Mateo-San Onofre area (Plate 2A). Other faults (Plate 2B) have been mapped in the coastal area but are usually only of local significance. The sediments in the coastal area show little or no folding and dip westward at a low angle.

The topographic expression of the major fault zones is recognized by elongate parallel valleys and/or steep escarpments. However, the trace of some of these faults has been buried, in part, by large masses of slope wash and landslide material as in the Murrieta-Temecula area. In addition to the major faults, there are also numerous minor faults in the crystalline rock areas which are difficult to delineate.

The general drainage pattern of the Region appears to be almost rectangular: that is, both the main stream and its tributaries display right-angle bends. This can be interpreted as an indication of fault control. As a general rule, there are always many more minor fault features than major ones, and there are many more minor drainages than major drainages. Therefore, assuming that fault patterns influence stream courses, the orientations of drainage lines should be indicative of the previously mentioned minor faults. On this basis, measurements of the strike (in direction of flow) of about 180 drainage lines were made, the results of which are shown on Figure 3. This diagram indicates the presence of two drainage line orientations in contrast to the Elsinore fault zone and associated parallel faults: (1) a northeast-southwest trending system that is approximately at right angles to the strike of the Elsinore fault zone; and (2) a nearly east-west trending system at about 45 degrees to the strike of the Elsinore fault zone. The first orientation is thought to reflect part of the original drainage pattern of the Region, which developed on primary fractures associated with the regional stress pattern that formed the Elsinore fault zone. The second orientation represents the consequent drainage pattern that formed on the westward tilted sediments of the coastal plain. These westerly flowing streams have captured the drainage of the original southwest flowing streams to form the present-day drainage pattern as shown by the San Diego and Sweetwater Rivers. On the other hand, part of the original drainage that formed parallel to the Elsinore fault zone still remains as shown by Temecula and Murrieta Creeks.

Thus, Figure 3 shows an interesting structural pattern in the San Diego Region that is made up of the northwest-southeast trending major faults and associated northeast-southwest trending fractures. This structural pattern in crystalline rocks indicates possible sites for water wells. This is because a major criterion for the occurrence of water in any crystalline rock is the presence of a large number of openings. On this basis, the intersection of northeast trending fractures with the northwest trending major faults would appear to be a likely place to drill for water.



NOTE: 1 PREDOMINANT NORTHEAST-SOUTHWEST TRENDING SYSTEM
2 PREDOMINANT NEARLY EAST-WEST TRENDING SYSTEM
PERCENT OF DRAINAGE LINES FALLING WITHIN A GIVEN ORIENTATION

Figure 3.- DIRECTION OF DRAINAGE LINES IN THE SAN DIEGO REGION

CHAPTER III. WATER SUPPLY

Cultural development of the San Diego Region began in 1769 with the founding of Mission San Diego de Alcala by the Franciscan Fathers near the present City of San Diego. This was nearly coincident with the initial development of the water resources of the area. As early as 1813, the Franciscan Fathers built a reservoir on the San Diego River and conveyed water 6 miles downstream to the mission. Much of the masonry dam and parts of the masonry-lined conduit are still standing.

In 1850, the year California was admitted into the Union, the City of San Diego was incorporated. The first successful organized effort to provide a water supply for the city began with the incorporation of the San Diego Water Company in 1873. A well, 10.5 feet in diameter and 160 feet deep, was dug in 1874 near the mouth of Cabrillo Canyon in what is now Balboa Park. From this well, the first water deliveries were made by the San Diego Water Company. From 1887 to 1924, many reservoirs, such as Cuyamaca, Morena, Otay, and Wohlford, were built.

Since the turn of the century, intense activity in ground and surface water development has taken place in the San Diego Region. In recent years, much of the Region has become a rapidly developing urban-suburban area. This rapid urbanization has lead to a steadily increasing demand for dependable supplies of usable water.

The primary uses of water in the San Diego Region are for domestic, industrial, and agricultural purposes. In the area serviced by the San Diego County Water Authority, roughly the western one-half of the San Diego Region, the water production per capita for urban uses during the fiscal year 1963-64, was about 0.14 acre-foot, and for agricultural purposes it was approximately 0.06 acre-foot. In recent years, the ratio of domestic and industrial use to agricultural water use has remained at about two to one, and the increases in water use for agriculture have kept pace with the increasing demands of urban-suburban uses.

PRESENT SOURCES OF SUPPLY

The principal sources of water in the Region are precipitation, runoff, ground water, and imported water. The amounts contributed by each depend upon population density, geography, and climatological conditions. This section deals with the development of these sources and their contributions to the supply. The long-term mean periods referred to in this report were selected from DWR Bulletin Nos. 112 and 130-64.

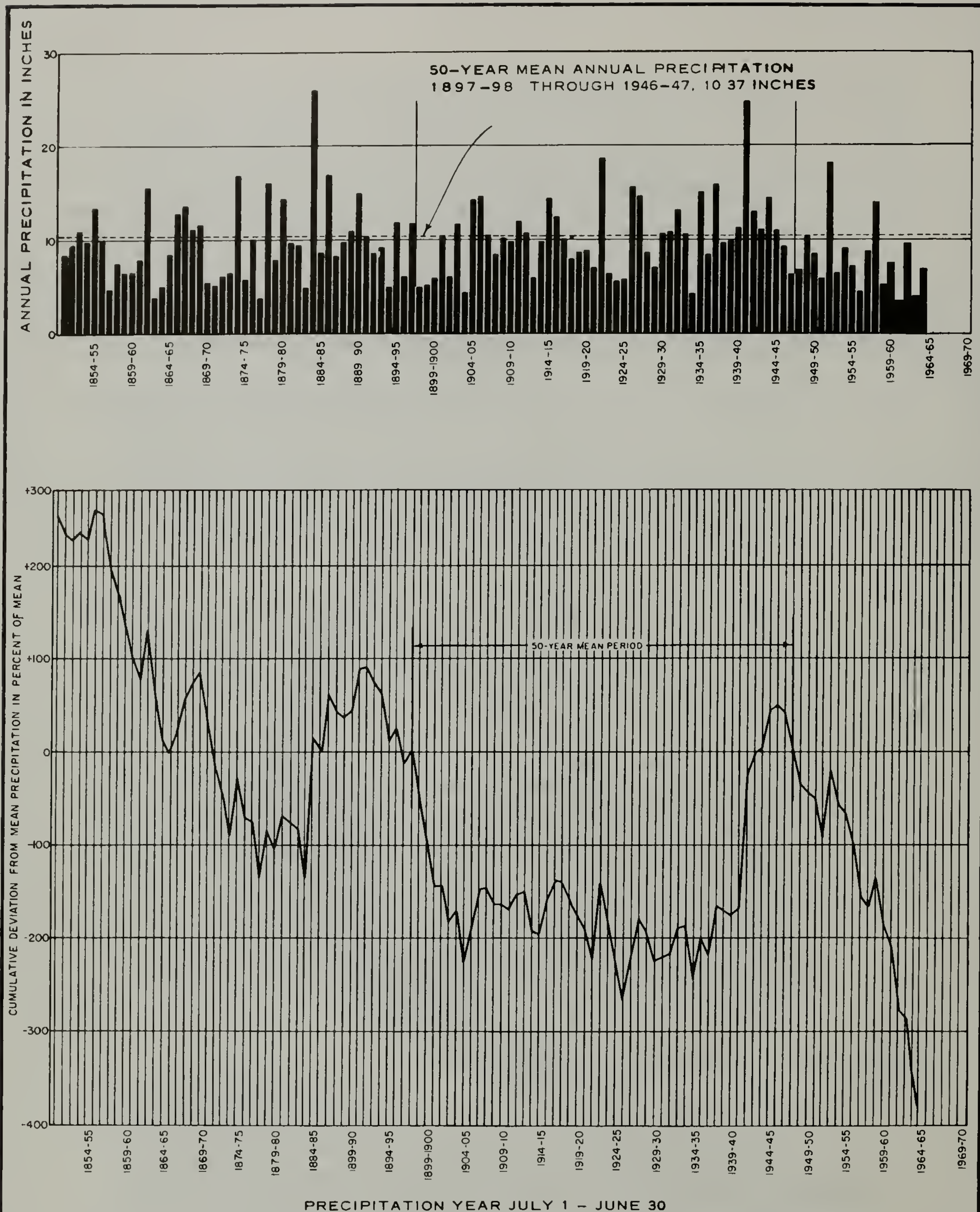


Figure 4 – REPRESENTATIVE PRECIPITATION CHARACTERISTICS FOR SAN DIEGO

DEPARTMENT OF WATER RESOURCES, SOUTHERN DISTRICT, 1966

Precipitation and Surface Water

Precipitation in the San Diego Region is extremely variable, both geographically and seasonally. The mean annual precipitation (Plate 5) varies from approximately 10 inches near the coast to more than 45 inches in the Palomar Mountain area.

An example of the wide variation in annual precipitation may be seen in Figure 4. At San Diego, the annual precipitation has ranged from about 3 to more than 26 inches for the period of record, 1850-51 through 1963-64. The general deficiency of precipitation at San Diego since the mid-1940's is indicative of the general lack of precipitation throughout much of the Region. This precipitation deficiency has had an important bearing on the amount of runoff and therefore, the Region's local water supply.

Runoff in the San Diego Region results mainly from rainfall. The melting of snowpack also contributes small additional amounts of runoff as do springs.

The major streams draining the coastal section of the San Diego Region include San Juan Creek and the Santa Margarita, San Luis Rey, San Dieguito, San Diego, Sweetwater, Otay, and Tia Juana Rivers. Their valleys are generally characterized by wide, flat, gently sloping floors, bordered by very steep slopes or bluffs several hundred feet high. Their streams have headwaters reaching far back into the highland areas.

There has been a long-term reduction in the amount of runoff produced by these streams as shown by the example in Figure 5 for Santa Ysabel Creek at Sutherland Dam. The deficiency of runoff that began in the mid-1940's coincides approximately with the deficiency of precipitation shown in Figure 4.

However, it should be noted that a moderate increase in precipitation would not cause an immediate increase in runoff. This is because of a lack of moisture in the ground -- a lack that exists both in the alluvium of the valleys and in the relatively thin but widespread residuum in other parts of the drainage areas. Therefore, any moderate increase in precipitation would tend to be absorbed, at first, in the alluvium and residuum before it produced any appreciable runoff and storage in the surface reservoirs.

The mean runoff for the 20-year drought period 1944-45 through 1963-64 at three selected stations (Table 2) further emphasizes the lack of runoff throughout the Region. As can be seen from this table, the mean runoff for the 20-year period was less than 40 percent of the estimated 53-year mean (1894-95 through 1946-47). Consequently, as indicated, there has been a serious

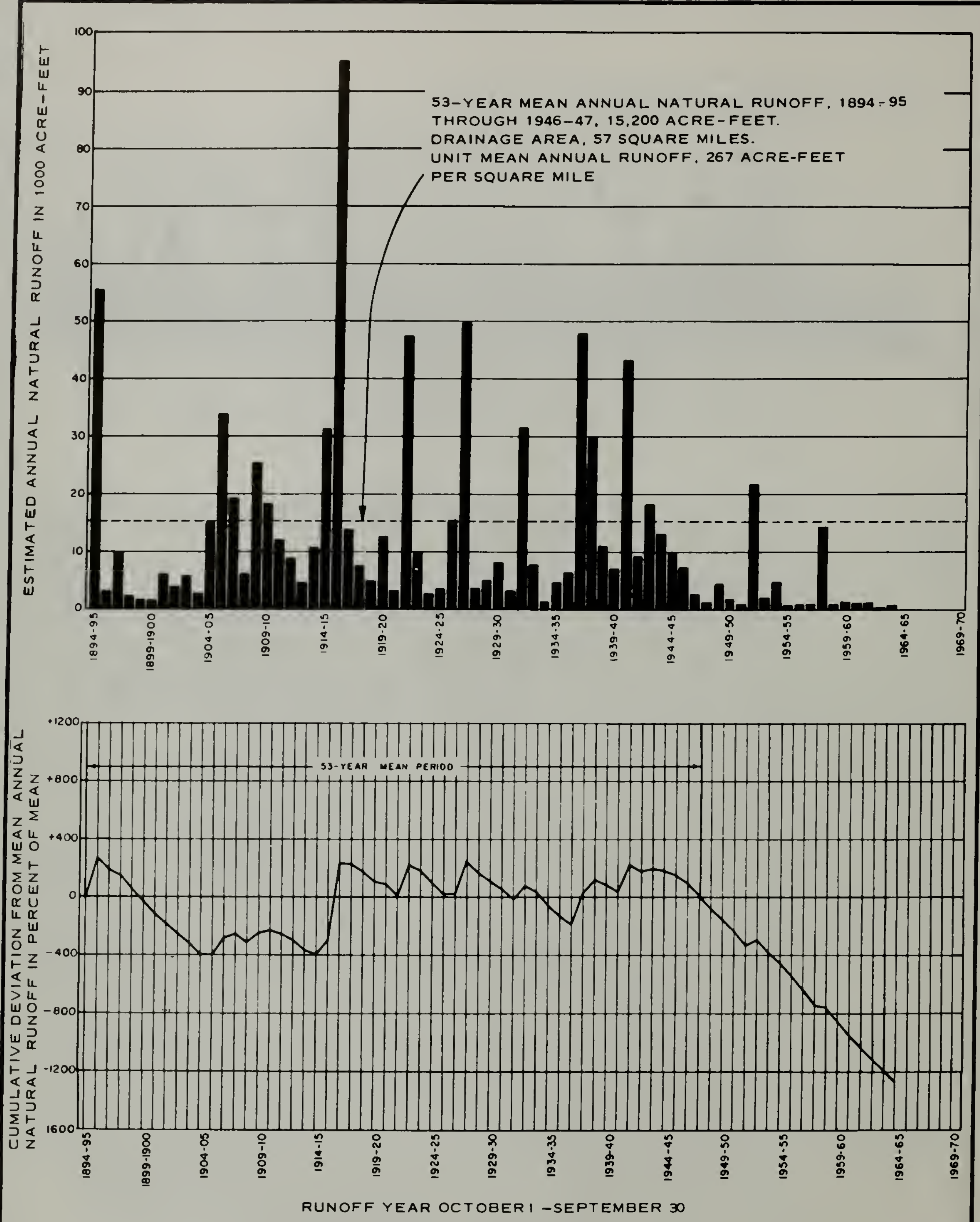


Figure 5 – REPRESENTATIVE RUNOFF CHARACTERISTICS
SANTA YSABEL CREEK AT SUTHERLAND DAM

DEPARTMENT OF WATER RESOURCES, SOUTHERN DISTRICT, 1966

TABLE 2

ESTIMATED ANNUAL RUNOFF AT
SELECTED STATIONS IN THE SAN DIEGO REGION
FOR 1944-45 THROUGH 1963-64

In acre-feet

Station	Period of record	20-year mean[a]	53-year mean[b]	20-year mean as percent of 53-year mean	Maximum[c]		Minimum[c]	
					Runoff year	Quantity	Runoff year	Quantity
Murrieta Creek at Temecula	1924 to date	3,100	8,670	36	1915-16	60,300	1963-64	280
Santa Ysabel Creek at Sutherland Dam	1913-28 and 1936 to date	3,840	15,200	25	1915-16	95,200	1960-61	130
Cottonwood Creek at Morena Dam	1936 to date	2,150	12,400	17	1915-16	75,300	1947-48	0

a. Estimated mean for 1944-45 through 1963-64.
b. Estimated mean for 1894-95 through 1946-47.
c. Indicated maxima and minima are estimated values for 1894-95 to date.

deficiency of the surface waters which previously had been a major source of supply for the San Diego Region. As of May 1, 1965, 15 major reservoirs held only 17 percent of their total storage capacity, with most of this derived from the storage of imported Colorado River water (Table 3). Locations of these reservoirs are shown on Plates 3A, 3B, and 3C. Thus runoff, which once was a major portion of the San Diego Region's water supply, has now been relegated to a minor role in the overall water supply of the Region.

Ground Water

Historically, ground water has been an important source of supply in the San Diego Region as shown by the large number of wells (Plates 6A, 6B, and 6C) that have been drilled (see Appendix C for well numbering system). The utilization of ground water supplies depends mainly on its availability, which is a function of pumping costs and quality, demand by the populace, and cost and availability of other sources. In recent years, the demand has progressively increased, the availability of ground water has decreased, its quality has been impaired in many areas, and imported Colorado River water has become readily available. These factors have relegated ground water to a minor position as a source of water supply for much of the Region.

However, in many areas in the San Diego Region, such as the Temecula-Murrieta area and Pala-Pauma Valleys, ground water is currently the only supply of water for domestic and irrigation purposes. Elsewhere, small domestic wells are the only source of supply for the isolated or small rancher. In other areas, such as Escondido, ground water is used to supplement supplies from other sources.

Occurrence

Ground water is found throughout the San Diego Region in variable quantity and quality. Most of the readily extractable ground water is obtained primarily from reservoirs consisting of alluvium and Pleistocene sediments. Smaller quantities of ground water are also found in the pre-Quaternary sediments, residuum, and crystalline rocks. The amounts of ground water available in various portions of the Region depend upon geologic and hydrologic conditions that will be discussed in the following sections.

TABLE 3

WATER IN STORAGE IN MAJOR RESERVOIRS IN SAN DIEGO REGION

In acre-feet

Area and watershed	Reservoir	Usable storage capacity	Water in storage	
			As of May 1, 1965	Percent of capacity
Santa Margarita-San Luis Rey Rivers				
Temecula Creek	Vail	49,500	2,360	4.8
San Luis Rey River	Lake Henshaw	194,300	8,820	4.5
San Dieguito-San Diego Rivers				
San Dieguito River	Lake Hodges*	33,600	1,670	5.0
Santa Ysabel Creek	Sutherland	29,700	3,640	12.3
San Vicente Creek	San Vicente*	90,200	72,300	80.2
San Diego River	El Capitan*	112,800	14,210	12.6
Boulder Creek	Cuyamaca	11,600	1,140	9.8
Quail Canyon Creek	Chet Harritt*	10,500	4,750	45.2
Big Surr Creek	Miramar*	7,270	6,250	86.0
Chapparel Canyon	Murray*	5,740	4,480	78.1
Sweetwater-Otay Rivers and Cottonwood Creek				
Sweetwater River	Lake Loveland	25,400	2,130	8.4
	Sweetwater (Main)*	27,700	2,480	9.0
Otay River	Lower Otay*	56,500	2,760	4.9
Cottonwood Creek	Morena	50,200	360	0.7
	Barrett	44,800	1,580	3.5

* Stores imported Colorado River water and some local water.

Barrett Dam and Reservoir
November 15, 1937

City of San Diego

Surface waters were a major source of supply for the San Diego Region.

Alluvium and Pleistocene Sediments. Unconsolidated alluvial deposits, which fill the river valleys, constitute by far, the most abundant source of ground water. However, in comparison with other major rock types in the Region, they are of limited extent.

The alluvium is generally moderately to highly permeable. It is recharged principally by deep penetration of direct rainfall, percolation of streamflow originating in the watershed, return flow from applied water, and underflow from adjacent areas. A general lack of precipitation and overpumping of the ground water reservoirs, as in the San Dieguito, Tia Juana, and San Luis Rey River Valleys (Plate 7), have caused a reversal of the historic seaward hydraulic gradient resulting in sea-water intrusion and migration of connate waters. Therefore, the usefulness of the alluvium as a source of ground water in many coastal areas has been diminished as a consequence of the impairment of the ground water quality.

Small Well with Pressure Tank

Locally, small domestic wells are the only source of supply for the isolated or small rancher.

The older alluvium is usually exposed as erosional remnants in stream-cut terraces along the sides of valleys. It is principally recharged by deep penetration of direct rainfall and percolation of streamflow originating in the watershed. Older alluvium is generally considered to be moderately permeable and a good source of ground water where it is not cemented or elevated above the water table.

The continental sediments which occur in the Pala-Pauma, Temecula-Murrieta, Warner Springs, and Aguanga areas are important sources of ground water and are tapped by many wells. These sediments (Pala Fanglomerate, Pauba and Dripping Springs Formations, and Temecula Arkose) have coarse-grained phased that are moderately to highly permeable and fine-grained phases, which have low to moderate permeability. Recharge of these sediments is principally from deep penetration of direct rainfall, runoff, and return irrigation waters, and from underflow from adjoining areas. The continental sediments are generally a good source of ground water. Some of the wells extracting ground water from the Temecula Arkose, for example, produce in excess of 1,500 gallons per minute.

The Linda Vista and Bay Point Formations and related unnamed Pleistocene marine and nonmarine sandstones, siltstones, and conglomerates generally occur in the coastal plain. They are usually less than 300 feet thick. As a rule, these sediments usually occur above the water table and are generally nonwater bearing. Permeability is variable and, where cementation by iron oxides has occurred, the sediments are relatively impermeable. In general, however, rocks of this group readily permit percolation of rainfall and runoff to the underlying sediments.

Pre-Quaternary Sediments. The major water-bearing Tertiary sediments are the San Diego and La Jolla Formations and, to a lesser degree, the Poway Conglomerate. The most favorable source of water in these rocks is the coarser strata. Recharge is mainly from direct percolation of rainfall and runoff and from percolation of water from overlying or adjacent permeable sediments.

Wells in the San Diego Formation are generally deep, with some penetrating to depths of more than 1,000 feet. The La Jolla Formation has been drilled extensively, although amounts of water produced have been generally small to moderate. Some production is also obtained from the Poway Conglomerate and Capistrano and San Mateo Formations, but yields from wells have been highly variable.

Crystalline Rocks and Residuum. The water-bearing characteristics of crystalline rocks depend on the degree of weathering, the presence of fracture and joint patterns, the structure, and the rock type. Unweathered and unfractured crystalline rocks generally have a porosity of less than 1 percent and a permeability so small as to be almost negligible. In the San Diego Region, however, these rocks usually display a well developed joint and fracture pattern. This enhances the rate and degree of weathering.

The weathered product, called residuum, is found to some degree in the crystalline rock areas throughout much of the San Diego Region. It is discussed in this section because of its inseparable relation with the parent crystalline rock.

Depending on the extent of weathering (decomposition and disintegration), varying quantities of ground water can be stored within the interstitial openings of residuum. Its permeability is considered to be low and, although the yield of wells in residuum is comparatively small, it is locally an important source of water.

Principal recharge of residuum is by deep penetration of direct rainfall and percolation of streamflow originating in the watershed. However, in many of the highland areas, the residuum lies generally above the water table and is not a significant contributor to the ground water supply.

As discussed in Chapter II, the particular rock type is an important factor in determining the degree and depth of weathering. This, in turn, affects the water-bearing properties of the residuum. On this basis, assuming that all other factors are held constant, the residuum of the different rock types can be ranked according to the probability of obtaining reliable yields of water for individual domestic users. In decreasing order, they are generally tonalite, metamorphic rocks, gabbro, and granodiorite.

Tonalite, which has the largest areal extent of the crystalline rocks, is an even-grained rock that weathers to a friable sand-like soil with scattered boulders. The interstitial openings, resulting from the volume changes accompanying weathering, provide spaces for ground water.

Few problems are encountered in drilling, because this residuum is uniform and soft. Although wells in the residuum from other rock types may yield more water, the tonalite residuum is probably the most consistent producer.

The physical properties of metamorphic rocks are variable, but many of the rocks are schistose or slaty and have innumerable closely spaced joints. These properties, as well as the general absence of clayey alteration products, increase the permeability and storage capacity of the residuum from these rocks. However, the yield of water from this residuum is highly erratic and the success of a well depends largely upon local conditions and the particular metamorphic rocks involved. Although the metamorphic rocks may weather deeply, drilling may be difficult because of hard, slaty bands and quartzitic interbeds.

Most gabbros weather deeply. The resulting residuum is similar to that developed in tonalite, except that it is less uniform and may contain hard zones. The granodiorites generally have joints and fractures that are more widely spaced than those in the other crystalline rocks. This, plus the fact that its weathering products are usually clayey, makes residuum from granodiorites generally an unreliable source of ground water.

In recent years, a general lowering of water tables has taken place because of increased pumping and a lack of precipitation. This has caused many wells in the residuum to go dry. To maintain the local domestic supply, the number of wells being drilled into unweathered crystalline rocks has increased. Even so, in some areas, as southeast of El Cajon, thick accumulations of residuum and fractured crystalline rock are still yielding significant quantities of water.

The fractures and joints in crystalline rock, which extend to considerable depths below the weathered zone, are capable of accumulating large quantities of water that can move through these openings. Recharge is by direct precipitation and runoff from adjoining areas.

The wells in crystalline rock yield from less than 1 up to about 400 gallons per minute, depending upon the extent of fractures and joints, and the number of laterals (horizontal collectors) drilled. The average depth of a well in crystalline rock is roughly 200 to 250 feet, with some wells extending to 600 feet. Average cost of these wells is $2,000 to $2,500, but costs as high as $10,000 are not uncommon.

Water Levels

In general, the water table in the Region occurs at depths less than 50 feet below the ground surface, and in many areas, less than 25 feet below the surface (Plates 8A, 8B, and 8C). There are local exceptions, such as in the Pala and Pauma Valleys, the Murrieta area, and the inland portion of the Tia Juana and San Luis Rey Rivers, where the ground water levels are 75 feet to more than 100 feet below the surface.

As may be seen in Figure 6, water levels at selected wells have decline approximately 30 to 70 feet since 1945. This decline in water levels appears to be generally related to the decline in precipitation, coupled with an increased use of ground water due to population growth (Figure 4), which has resulted in a reduction of water in storage. Topography also is a major factor influencing the level of the water table. For example, depths to water in the mesa areas of the Tia Juana River Valley are greater than 500 feet because of their position relative to the floor of the river valley. In addition, the water table generally reflects, in subdued form, the configuration of the ground surface because of the influence of topography on recharge and movement. Man's activities,

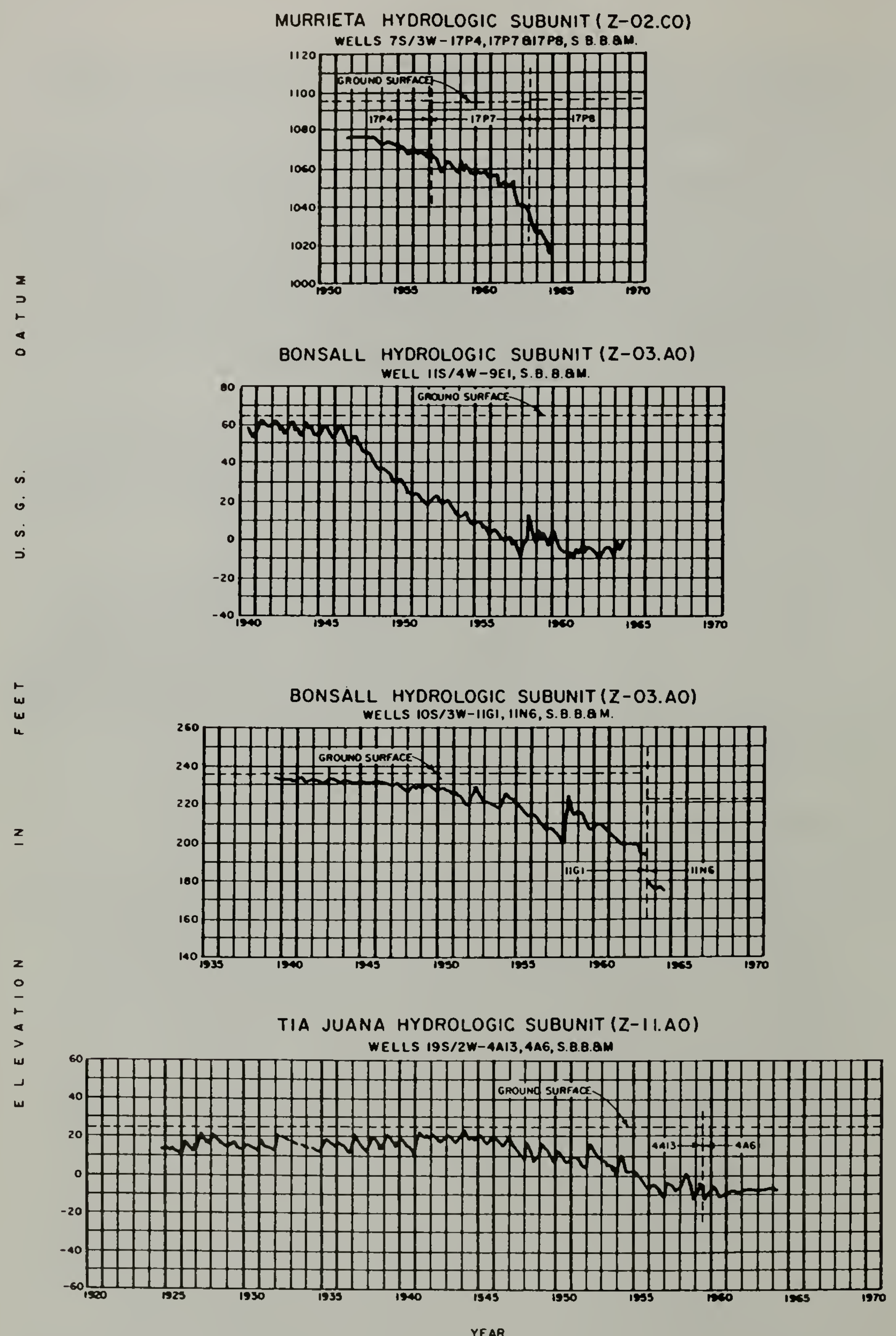


Figure 6 – HYDROGRAPHS OF GROUND WATER AT SELECTED WELLS IN THE SAN DIEGO REGION

DEPARTMENT OF WATER RESOURCES, SOUTHERN DISTRICT, 1966

as evidenced by overpumping, have also affected water levels and resulted in an overdraft of the ground water reservoirs. In some of the alluvium-filled coastal valleys, water levels have been drawn down as much as 50 feet below sea level with resulting sea-water intrusion and connate-water invasion (Plate 7).

The general lowering of water levels in the Region has resulted in increased costs of well drilling and ground water extractions. In particular, the unit cost of obtaining ground water in many areas has increased because of drilling deeper wells in residuum or because of increased drilling in fractured and jointed crystalline rocks.

Well Production

Ground water production or yield by wells in the major alluvial valleys of the San Diego Region depends primarily on the capacity of the water-bearing materials to transmit water, thickness of the water-bearing strata, and physical characteristics, number, and distribution of water wells.

An important consideration affecting the yield of wells in residuum is the development of laterals (horizontal collectors). The primary purpose of these lateral drill holes is to increase the flow of water to the vertical well. Wells with laterals produce the largest yields when they penetrate residuum of considerable depth and when they are situated in favorable topographic positions.

Generally, the yield of wells in the crystalline rocks is small with a large percentage of those drilled failing to intersect water-bearing fractures. The most favorable sites for hard rock wells is where drainage from surrounding slopes can supply sufficient recharge to the rock fissures.

A general summary of the rate of initial well production of ground water from: (1) alluvium and Pleistocene sediments, (2) pre-Quaternary sediments, and (3) residuum and fractured crystalline rocks is shown in Figure 7. The percent of wells within a range of production for a given rock type is obtained by dividing the number of wells within this range by the total number of producing wells. Figure 7 is based on the rate of initial production from approximately 200 wells and is considered to be representative of the Region.

As is shown, wells drilled in alluvium and Pleistocene sediments or in pre-Quaternary sediments have had initial productions that ranged from nearly zero to more than 1,000 gallons per minute. However, according to the records of wells drilled, alluvium and Pleistocene sediments more often have yielded the larger amounts, while the pre-Quaternary sediments have had a lower, more variable initial production.

Wells drilled in residuum and fractured crystalline rocks show a narrower range of initial production than the other rock types. The data indicate that residuum would be an unlikely source for a continuous supply of water sufficient for extensive irrigation or major domestic purposes. More than 65 percent of wells drilled in residuum and fractured crystalline rocks fell within the production range of nearly zero to 25 gallons per minute. Nonetheless, the residuum is a good source of water (assuming sufficient recharge and proper development of wells) for local domestic uses.

Imported Water

The coastal section of the San Diego Region, excluding Camp Pendleton, relies essentially on imported water as a source

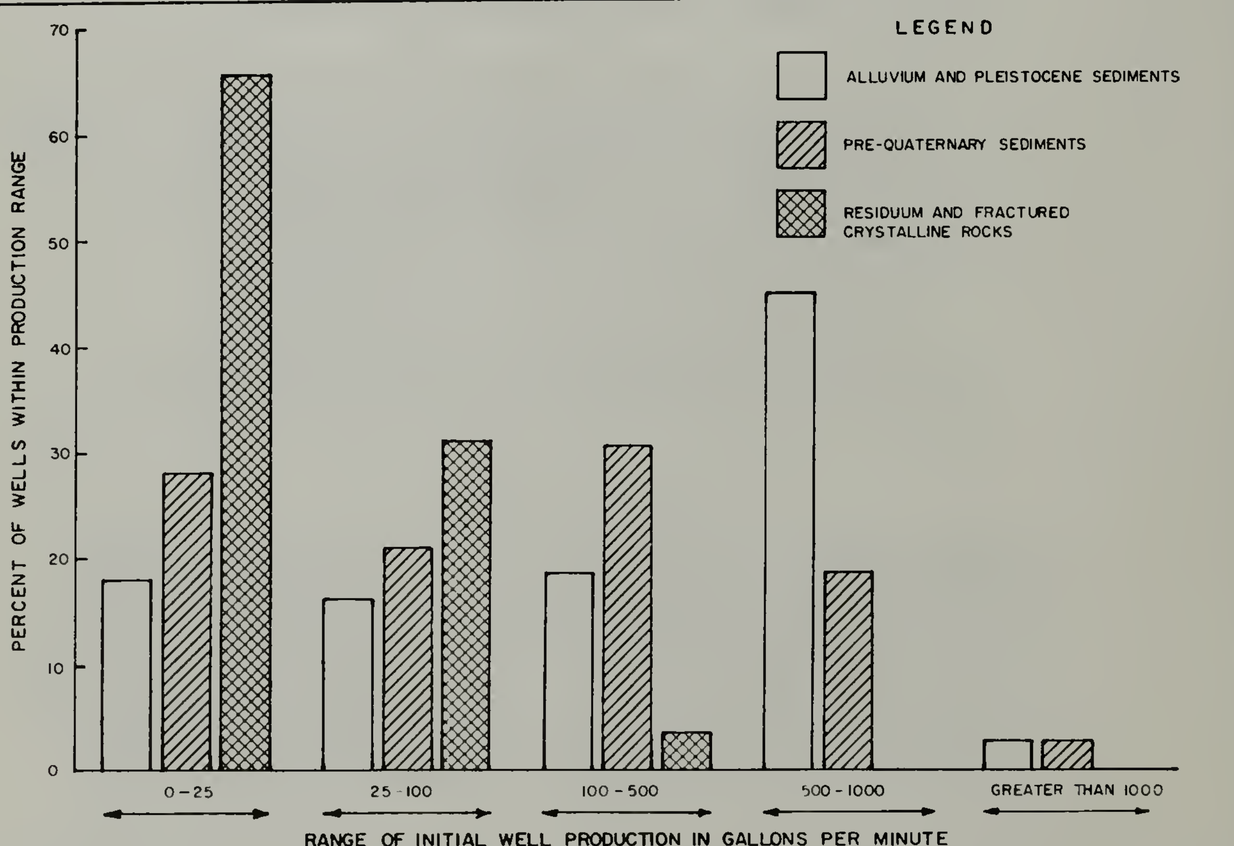


Figure 7 – RATE OF INITIAL WELL PRODUCTION FROM SELECTED SOURCES

San Diego County Water Authority

Construction of Second Barrel of First Aqueduct, 1953

of supply and derives only minor amounts from local production. Generally speaking, the local water supply, even under ideal conditions, is a limited source. With increasing demand, importation of water becomes unavoidable if growth in the San Diego Region is to continue.

In November 1947, the first barrel of the First San Diego Aqueduct commenced to deliver Colorado River water. It was constructed by the U. S. Navy as an emergency measure to meet the increased demand for water caused by accelerated population growth which accompanied the rapid expansion of military and industrial facilities during World War II. In 1954, the second barrel was completed, bringing the total capacity of the first aqueduct to 196 cubic feet per second. Ownership and operation were then assumed by the San Diego County Water Authority.

Increasing demands for water necessitated the construction of the first barrel of the Second San Diego Aqueduct by The Metropolitan Water District of Southern California and the San Diego County Water Authority. This barrel, with a capacity of 250 cubic feet per second, was completed in 1960. The combined capacity of both aqueducts is 446 cubic feet per second; however, projections of needs by the San Diego County Water Authority indicate that a second barrel of the Second Aqueduct, with a capacity of 430 cubic feet per second, will be needed by about 1970.

In southern Orange County, San Juan Capistrano and San Clemente started receiving deliveries of imported Colorado River water from the member municipalities of the Metropolitan Water District between April and June 1964. In the upper reaches of Arroyo Trabuco, importation of Colorado River water began in July 1964 as a supplement to the local supply.

A summary of imported and local water production is shown in Table 4. The increase in the amount of imported water and the relative reduction in local production may be readily seen. For the fiscal year 1963-64, about 233,800 acre-feet of Colorado River water were imported, and from 1947-48 through 1963-64, a total of about 2,043,100 acre-feet had been imported into the Region. Local production in the area serviced by the San Diego County Water Authority amounted to only about 10 percent of the water supply. But for the whole Region, local sources made up about 20 percent, or 56,700

TABLE 4

ESTIMATED LOCAL AND IMPORTED WATER PRODUCTION IN SAN DIEGO REGION

In acre-feet

Fiscal year	Sales of Colorado River water	Local production*	Total supply	Local production, as percent of total supply
1947-48	41,000	105,600	146,600	72
1948-49	71,600	79,100	150,700	52
1949-50	58,600	65,400	124,000	53
1950-51	81,800	49,000	130,800	38
1951-52	62,100	65,100	127,200	51
1952-53	32,600	104,400	137,000	76
1953-54	73,200	117,100	190,300	62
1954-55	102,700	88,600	191,300	46
1955-56	136,700	71,500	208,200	34
1956-57	149,000	62,800	211,800	30
1957-58	143,900	61,500	205,400	30
1958-59	100,300	105,900	206,200	50
1959-60	159,600	90,800	250,400	36
1960-61	191,500	54,200	245,700	22
1961-62	183,700	51,900	235,600	22
1962-63	221,000	52,800	273,800	19
1963-64	233,800	56,700	290,500	20
TOTALS	2,043,100	1,282,400	3,325,500	39

*Includes ground water and runoff based on DWR Bulletin No. 78-D, DWR Bulletin No. 70, and Annual Reports of San Diego County Water Authority.

acre-feet, of the total supply for the fiscal year 1963-64, as compared to 72 percent, or 105,600 acre-feet, for 1947-48.

However, it should be noted that approximately one-half of the local production for 1963-64 was obtained from southwest Riverside County and southeast Orange County -- an area which contains less than 5 percent of the total population of the San Diego Region.

Santee Project,
May 1965

Photograph by B. A. Gustafson
for U. S. Public Health Service

The Santee County Water District operates a planned reclamation system of several small lakes which are used for recreation.

POTENTIAL SOURCES OF SUPPLY

Potential sources of water, in addition to Colorado River water, runoff, and ground water, are reclaimed waste water, desalinized sea water, and water imported through the State Water Project.

The waste water treatment facilities in the San Diego Region discharged about 83,700 acre-feet of effluent during the fiscal year 1963-64 (DWR report on "Quantity, Quality, and Use of Waste Water in Southern California", April 1966). Of this total, about 67,900 acre-feet were discharged to the ocean and the remainder inland. Approximately 15,300 acre-feet of the water discharged inland were reclaimed during 1963-64; of this quantity about one-half was planned reclamation. In many cases, it was "involuntary reclamation", with waste water commingling with water from other sources, as in lakes, streams, or percolation to the ground water reservoirs.

An example of the potentialities of planned waste water reclamation may be seen at Santee, within the drainage of the San Diego River. Here, the Santee County Water District operates a planned reclamation system of several small lakes which are used for recreation. DWR Bulletin No. 80-2, "Reclamation of Water from Wastes in Coastal San Diego County" (Preliminary Edition) February 1966, is a report on the feasibility of reclaiming waste water for beneficial uses in coastal San Diego County.

Another potential source of water is desalination. A plant, in part financed by the Department and operated on an experimental basis, was dedicated March 10, 1962, at Point Loma. This plant, while in operation, supplemented the City of San Diego's water supply. It had a capacity of one million gallons per day. In June 1964, the Point Loma plant was dismantled and shipped to Guantanamo Naval Base, Cuba.

With the passage of the Cobey-Porter Saline Water Conversion Bill and a companion bill in 1965, the Department was enabled to cooperate with the U. S. Office of Saline Water in planning the San Diego Saline Water Test Facility. This facility will be constructed in Chula Vista on San Diego Bay in two phases. Phase I, which will replace the dismantled Point Loma plant, is scheduled to go into operation in the early summer of 1967. It will consist of a one-million-gallon per day advance design flash distillation plant. Phase II will consist of test facilities which will produce up to three million gallons per day. It is scheduled for completion one year later and will be used for the testing of full-scale modules and components of saline water conversion plants. This water will be delivered by the Department to a local water entity for distribution.

Point Loma Desalinizing Plant, March 1962 — California Division of Highways

While in operation, the plant supplemented the City of San Diego water supply.

A future source of supply for the San Diego Region is Northern California water via the State Water Project. The Metropolitan Water District of Southern California has contracted with the State of California for a maximum annual entitlement of 2,011,500 acre-feet from the State Water Project. The San Diego County Water Authority, a member of the Metropolitan Water District, will receive supplemental water from this source in 1972. This imported water may be distributed by surface conveyance facilities to the populace or utilized directly to recharge the ground water reservoirs.

In the future, use of supplemental waters, such as imported Northern California water, could help alleviate overdraft conditions of the ground water reservoirs. Thus, the encroachment of saline waters could be halted and normal seaward hydraulic gradients be reestablished in the coastal alluvium-filled valleys.

CHAPTER IV. WATER QUALITY

The purpose of this chapter is to show what measurements, evaluations, and criteria were used by the investigators to determine the quality of the water in the San Diego Region. To carry out this purpose, the investigators, using information collected in the water quality surveillance program which the Department maintains, evaluated the chemical constituents within the water and established meaningful criteria for rating it.

This chapter describes the common chemical constituents and their occurrence. The next chapter will deal in detail with the factors within the environment -- both natural and manmade -- that determine the quality of the water. In the final chapter, information will be given on the quality of water in the individual hydrologic units of the Region.

CHEMICAL CONSTITUENTS AND PROPERTIES

Of primary inportance in making a water quality study is the determination of the chemical constituents and properties inherent in the water and, of these, which are significant (see Appendix D).

In the San Diego Region, as elsewhere, the kinds and amounts of chemical constituents in water are governed by the types of rock material and soils with which it comes in contact.

Precipitation and runoff also generally govern the concentration of constituents in water by the mechanism of dilution. Water containing the smallest quantities of dissolved constituents is usually found in areas having the greatest amount of precipitation and runoff, particularly where such areas are underlain by crystalline rocks.

The chemical constituents and properties commonly occurring in surface and ground water in the San Diego Region are discussed in the following section. These include calcium, magnesium, sodium, potassium, carbonate, bicarbonate, sulfate, chloride, nitrate, boron, electrical conductivity, total dissolved solids, radioactivity, and chemical character.

Calcium (Ca)

Calcium can be dissolved from most rocks, but the highest concentrations of calcium in the San Diego Region are usually in waters that have been in contact with the more basic intrusive rocks or with gypsiferous sedimentary rocks.

Sampling Ground Water from Pressurized Well System

The Department collects information in its water quality surveillance program.

For irrigation, especially of clayey soils, calcium should form a high percentage of the cations so that the irrigated soil will be arable and permeable. In contrast, calcium should not be present in high concentrations in water used for domestic and industrial purposes because it is the principal cause of hardness and scale in boilers and water pipes. Calcium also reacts with soap, producing a gray scum that inhibits lathering.

Magnesium (Mg)

In the Region, waters relatively rich in magnesium are generally associated with the more basic crystalline rocks such as the gabbros. Magnesium increases the hardness of water and the scale-forming properties in the same manner as does calcium. Also, water containing about 125 parts per million of magnesium and about 500 parts per million of sulfate may produce a noticeable laxative effect in persons unaccustomed to these concentrations in their drinking water.

Sodium (Na) and Potassium (K)

In the San Diego Region, sodium and potassium are dissolved from most rock materials. However, the sodium concentration generally far exceeds the potassium concentration in surface and ground water. Although potassium is present in most of the crystalline rocks, its concentration in surface and ground water is negligible as compared to the other major cations. This anomaly is due to the weathering characteristics of the various rocks and to the recombining of potassium released from these rocks with the clayey products of weathering.

Moderate quantities of sodium and potassium generally have only a small effect on the usefulness of water. However, industrial use of water containing moderately high concentrations of sodium and potassium may require that steam boilers be carefully operated to prevent foaming.

For laundry and cleaning purposes, it is desirable that sodium make up a high percentage of the cations because calcium and magnesium cause formation of soapy scums in household washing and deposition of scale in hot water pipes. For irrigation use, water should have a low ratio of sodium to total cations. Irrigation water with a high percent sodium decreases soil permeability by deflocculation, thereby reducing percolation to the plant root zone.

Carbonate (CO_3) and Bicarbonate (HCO_3)

The bicarbonate anion is normally the predominant anion in much of the native waters of the San Diego Region. Carbonate and bicarbonate are derived principally from the atmosphere and vegetation-covered lithosphere. Carbon dioxide in the atmosphere combines with moisture to form carbonic acid which aids in the rock weathering processes. Carbonic acid in solution dissociates to form bicarbonate ions that link with the cations released from weathering of the lithosphere. The relative concentrations of these two constituents affect the alkalinity or acidity (pH) of the water.

Sulfate (SO_4)

The most important sources of sulfate in native waters of the San Diego Region are the gypsiferous deposits and sulfide minerals associated with the crystalline rocks. Sulfate is particularly significant in water that contains large concentrations of calcium and magnesium. In combination with calcium and magnesium, sulfate forms deposits of hard scale in water pipes, water heaters, and boilers. Sulfate in combination with magnesium may produce laxative effects.

Chloride (Cl)

Most waters contain chloride because it is present in many rock types and is very soluble in water. All waters in the study area contain chloride that has been dissolved from rocks or has been derived from hot springs of deep-seated origin. In the coastal areas, high concentrations usually signify sea-water intrusion or inflow of connate waters from the Tertiary marine sediments or both. In addition, disposal of sewage and industrial wastes often introduces chloride into surface and ground waters.

High concentrations of chloride render water unusable for drinking or for processing of foods and beverages. For irrigation, water containing high chloride concentrations is undesirable because chloride causes subnormal growth of crops and burns the foliage, impairing the appearance and reducing the marketability of the crops.

Nitrate (NO_3)

Nitrate generally occurs only in trace quantities in nonpolluted water. Where it occurs in amounts exceeding a few parts per million in the San Diego Region, it is usually derived from by-products of organic decomposition and from chemical fertilizers. In addition, large quantities of nitrate result from nitrogen fixation by bacteria and plant legumes. Atmospheric storms also cause the fixation of nitrogen, and subsequent precipitation carries the nitrates into the soil.

In excessive amounts, 45 ppm or more, high nitrate concentrations in water used for preparing infant's feeding formulae may cause the infant illness methemoglobinemia (cyanosis).

Boron (B)

Boron usually occurs as a trace in nonpolluted waters. It is a major constituent of the mineral tourmaline which is widespread in the pegmatitic veins associated with igneous rocks. Also, some hot springs in the Region contain 2 to 4 ppm of boron.

The concentration of boron in water for agriculture is important. Boron in excess of 2 ppm in irrigation water is deleterious to many plants; less than 1 ppm adversely affects others. However, trace amounts are essential to the growth of many plants.

Electrical Conductivity (EC)

Electrical conductivity, which is expressed in micromhos at 25° C, is a quick method of measuring the ion concentration of a solution. Electrical conductivity is used as an indication of the total dissolved solids content of water.

Total Dissolved Solids (TDS)

The areal extent of total dissolved solids in ground water in the San Diego Region is shown on Plates 9A, 9B, and 9C, and for selected surface water stations on Plate 10. These plates are discussed in Chapter V and reviewed in Chapter VI.

Determination of the concentration of total dissolved solids in water furnishes an indication of its overall chemical content and serves as a criterion for appraising the chemical quality of water for beneficial uses.

For domestic use, waters are classified according to total dissolved solids content, which may be estimated from the electrical conductivity. For most waters, multiplying electrical conductivity by a factor of 0.5 to 0.7 gives a number that approximates the total dissolved solids content.

Radioactivity

The U. S. Public Health Service defines radioactivity as ionizing radiation that is harmful to the human body. Mankind has always been exposed to natural and background radiation. Any increase of radiation in the water supply above background could be a hazard to the public health.

The most common unit of measurement is the "curie"; however, the term "picocurie" per liter (pc/l) of water is used in this report. A picocurie is equal to a micro-microcurie (uuc) which is a millionth of a millionth of a curie, or approximately 2.22 disintegrations per minute. Naturally occurring radioactive concentrations in surface waters are very low, varying from about 0.10 to 10 picocuries per liter.

The following limits on radioactivity are taken from the Federal Register, Title 42-Public Health, dated March 6, 1962, and are given here as a guide to the reader for evaluating the radioactivity results from selected stations presented in Table 5.

"Limits. (1) The effects of human radiation exposure are viewed as harmful and any unnecessary exposure to ionizing radiation should be avoided. Approval of water supplies containing radioactive materials shall be based upon the judgment that the radioactivity intake from such water supplies when added to that from all other sources is not likely to result in an intake greater than the radiation protection guidance recommended by the Federal Radiation Council and approved by the President. Water supplies shall be approved without further consideration of other sources of radioactivity intake of Radium-226 and Strontium-90 when the water contains these substances in amounts not exceeding 3 and 10 uuc/liter, respectively. When these concentrations are exceeded, a water supply shall be approved by the certifying authority if surveillance of total intakes of radioactivity from all sources indicates that such intakes are within the limits recommended by the Federal Radiation Council for control action.

"(2) In the known absence of Strontium-90 and alpha emitters, the water supply is acceptable when the gross

TABLE 5

RADIOASSAYS OF SURFACE WATER FROM SELECTED STATIONS IN SAN DIEGO REGION

Sampling station*		Date sampled	Picocuries per liter			
Stream system	Number		Dissolved alpha	Solid alpha	Dissolved beta	Solid beta
Santa Margarita River near Fallbrook	S-15	5-15-64	0.28± 0.93	-0.05±0.80	-8.55± 8.70	13.52± 9.07
		9-18-64	2.86± 3.51	-0.57±0.48	-0.79±13.12	1.53± 7.93
Escondido Creek near Harmony Grove	S-26	5-14-64	4.53± 7.18	0.73±1.35	9.65±15.84	-3.54± 9.17
		9-17-64	3.48± 9.53	0.59±1.03	20.89±14.70	2.54± 7.86
San Diego River at Old Mission Dam	S-40	5-13-64	-3.55± 1.36	2.43±2.16	10.06±15.25	-4.47± 9.85
		9-15-64	-4.53± 2.09	0.29±0.80	0.31±16.09	3.72± 6.91
San Diego River near Mission Gorge Road	S-41	5-13-64	3.68± 5.82	0.02±0.74	13.61±15.52	1.32± 7.95
		9-15-64	4.09± 13.36	0.07±0.71	12.91±29.90	-3.57± 6.47
Spring Valley Creek near La Pressa	S-46	5-14-64	58.79±107.92	-0.03±0.77	-42.98±76.62	0.48± 8.39
		9-15-64	4.88± 29.71	0.99±1.04	-47.97±79.76	10.72± 8.99
Tia Juana River at International Boundary	S-53	5-14-64	0.91± 7.00	5.44±5.17	80.89±35.76	13.81±47.38

*See Plate 10 for location.

beta concentrations do not exceed 1,000 uuc/liter. Gross beta concentrations in excess of 1,000 uuc/liter shall be grounds for rejection of supply except when more complete analyses indicate that concentrations of nuclides are not likely to cause exposures greater than the Radiation Protection Guides as approved by the President on recommendation of the Federal Radiation Council."

Chemical Character

The chemical character of water is based on the determination of the predominant cations and anions in equivalents per million (epm). Specifically, the name of an ion is used where its chemical equivalent constitutes one-half or more of the total ions for its appropriate group. For example, sodium chloride water is water in which the sodium is equal to or greater than 50 percent of the cations and the chloride bears a like relationship to the anions. Also, sodium-calcium chloride water is water in which sodium, the major ion, is more abundant than calcium, the subordinate ion, but is less than 50 percent of the total cations. Likewise, sodium chloride-sulphate water is water in which chloride exceeds sulphate but is less than 50 percent of the total anions. The chemical character of a water is an important tool for tracing the factors influencing water quality. The chemical character of surface water in the San Diego Region is shown on Plate 10 and of ground water on Plates 11A, 11B, and 11C. These plates are discussed in Chapter V and Chapter VI.

QUALITY CRITERIA

Equally as important as determining the chemical constituents and properties of the water is establishing criteria, against which to measure those constituents and properties. Because of the different needs of each, separate sets of criteria have been developed for domestic and municipal use and for irrigation use.

Given here are the criteria that have been established for judging water in most locations. Following that discussion, specific criteria are presented in this bulletin that have been developed for use only in the San Diego Region.

General Criteria

The water quality criteria that are used in this investigation and report are based on the U. S. Department of Health, Education, and Welfare "Public Health Service Drinking Water Standards, 1962"; the California State Board of Public Health "Interim Policy on Mineral Quality of Drinking Water"; and the classification of water for irrigation purposes by Dr. L. D. Donneen of the Division of Irrigation of the University of California at Davis.

TABLE 6

U. S. PUBLIC HEALTH SERVICE
DRINKING WATER STANDARDS
1962

In milligrams per liter
(ppm)

Substance	Recommended limits of concentrations	Mandatory limits of concentrations
Alkyl benzene sulfonate (ABS)	0.5	--
Arsenic (As)	0.01	0.05
Barium (Ba)	--	1.0
Cadmium (Cd)	--	0.01
Carbon chloroform extract (CCE)	0.2	--
Chloride (Cl)	250	--
Chromium (hexavalent) Cr^{+6}	--	0.05
Copper (Cu)	1.0	--
Cyanide (CN)	0.01	0.2
Fluoride (F)	(*)	(*)
Iron (Fe)	0.3	--
Lead (Pb)	--	0.05
Manganese (Mn)	0.05	--
Nitrate (NO_3)**	45	--
Phenols	0.001	--
Selenium (Se)	--	0.01
Silver (Ag)	--	0.05
Sulfate (SO_4)	250	--
Total dissolved solids (TDS)	500	--
Zinc (Zn)	5	--

*Refer to following sections on fluoride.
**In areas in which the nitrate content of water is known to be in excess of the listed concentration, the public should be warned of the potential dangers of using the water for infant feeding.

To aid readers in interpreting the chemical analyses of ground water presented in Appendix D and in evaluating the suitability of a particular water for a specific purpose, the Department of Water Resources has adopted for this report only a set of water quality use ratings based upon the standards and classifications mentioned above. The development of such use ratings from the U. S. Public Health Service Standards for domestic and municipal use, and from the University of California irrigation criteria are discussed in this section.

Domestic and Municipal Use

Water that is used for drinking and culinary purposes should (1) be clear and colorless; (2) have no unpleasant taste and odor; (3) be free from toxic substances; (4) contain a relatively low level of dissolved chemical constituents; and (5) be free from pathogenic organisms. The most widely used criteria in determining the suitability of a water for this use are the "Public Health Service Drinking Water Standards, 1962". These standards establish mandatory limits of maximum permissible concentration for certain constituents and nonmandatory but recommended limits for others. Table 6 indicates these limits for drinking water.

In California, the State Board of Public Health issues water supply permits in accordance with its "Interim Policy on Mineral Quality of Drinking Water", as adopted September 4, 1959, and in accordance with "Policy Statement and Resolutions by the State Board of Public Health with Respect to Fluoride Ion Concentrations in Public Water Supplies", as approved August 22, 1958. The interim policy on mineral quality is presented as follows:

> "1. Water supply permits may be issued for drinking and culinary purposes only when the Public Health Service Drinking Water Standards of 1946[1] and the State Board of Public Health policy on fluorides are fully met.
>
> "2. In view of the wide variation in opinion in this field, the uncertainty as to the long-time health effects, the uncertainty of public attitude concerning various mineral levels, and the obvious need for further study, temporary permits may be

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[1] Author's Note: It is assumed, in the absence of any later proclamation, that the 1962 edition of the Drinking Water Standards now applies.

issued for drinking water supplies failing to meet the Drinking Water Standards if the mineral constituents do not exceed those listed under the heading 'Temporary Permit' in the following table:*

UPPER LIMITS OF TOTAL SOLIDS** AND
SELECTED MINERALS IN DRINKING WATER
AS DELIVERED TO THE CONSUMER

	Permit		Temporary Permit
Total Solids	500	(1,000)***	1,500 parts per million
Sulphates	250	(500)***	600 " " "
Chlorides	250	(500)***	600 " " "
Magnesium	125	(125)	150 " " "

*This interim policy relates to potable water and is not intended to apply to a secondary mineralized water supply intended for domestic uses other than drinking and culinary purposes.

**Waters having less than 32 milliequivalents per liter of dissolved minerals or 1,600 micromhos electrical conductance will usually have less than 1,000 parts per million total solids.

***Numbers in parentheses are maximum permissible, to be used only where no other more suitable waters are available in sufficient quantity for use in the system.

"3. Exception: No temporary permit for drinking water supplies in which the mineral constituents exceed those listed under the heading 'Temporary Permit' as set forth in #2 above may be issued unless the Board determines after public hearing:

(a) The water to be supplied will not endanger the lives or health of human beings; and

(b) No other solution to meet the local situation is practicable and feasible; and

(c) The applicant is making diligent effort to develop, and has reasonable prospect of developing a supply of water which will warrant a regular permit within an acceptable period of time.

The burden of presenting evidence to fulfill the requirements as set forth in (a), (b), and (c) above is upon the applicant".

With respect to fluoride concentration, the State Board of Public Health has defined the maximum safe amounts of fluoride ion in relation to mean annual air temperature.

Mean annual air temperature, in °F	Mean monthly maximum fluoride ion concentration, in ppm
50	1.5
60	1.0
70 - above	0.7

The mean annual air temperature of the San Diego Region generally falls within a range of 58° to 66° Fahrenheit.

Irrigation Use

Because of diverse climatological conditions, crops, and soils in California, it has not been possible to establish rigid limits for the quality of irrigation water to be used for all conditions involved. However, based on work done at the University of California and at the Rubidoux Regional Salinity Laboratories of the U. S. Department of Agriculture, water used for irrigation has been divided into three broad classes: Class 1, excellent to good; Class 2, good to injurious; and Class 3, injurious to unsatisfactory. Dr. L. D. Doneen has

TABLE 7

CRITERIA* FOR IRRIGATION WATERS

Factor	Class 1 (excellent to good)	Class 2 (good to injurious)	Class 3 (injurious to unsatisfactory)
Electrical conductivity, $ECx10^6$ at 25° C	Less than 1,000	1,000 - 3,000	More than 3,000
Boron, ppm	Less than 0.5	0.5 - 2.0	More than 2.0
Chloride, epm	Less than 5	5 - 10	More than 10
Percent sodium	Less than 60	60 - 75	More than 75

*It should be noted that the applicability of these various criteria will be determined by type of crops and climatological and soil conditions.

suggested a classification for water to be used for irrigation as shown in Table 7; this classification is used by the Department of Water Resources in determining water quality criteria for irrigation waters. Four criteria are generally used, as outlined by Dr. L. D. Doneen's classification, to determine the suitability of water for irrigation use: electrical conductivity (EC micromhos at 25° C), boron concentration, chloride concentration, and percent sodium.

Specific Criteria

The water quality use ratings adopted by the Department of Water Resources for use only in this investigation are shown in Table 8. These ratings are not to be construed as recommended limits. In arriving at the use ratings shown, due consideration was given to such factors as chemical quality of water now being used, climate, soil, and crop types. In addition, physiological and aesthetic effects were considered for domestic use ratings. The availability of alternative sources has been, and continues to be, an important consideration in suggesting maximum limits on dissolved constituents in water in the San Diego Region. The limits set forth by the U. S. Public Health Service for toxic constituents, such as barium, lead, cyanide, cadmium, silver, arsenic, selenium, and hexavalent chromium, should be adhered to.

On the basis of the water quality criteria discussed in this chapter and the conditions prevailing in the Region, waters for domestic and irrigation use in the San Diego Region are classified in one of three categories: suitable, marginal, or inferior. The constituents and the limits of concentration of these for each of the three categories are shown in Table 8. The rating of ground water for domestic uses are presented in Plates 12A, 12B, and 12C, and for irrigation uses in Plates 13A, 13B, and 13C. A discussion of these water use ratings for each hydrologic unit is presented in Chapter VI.

Where waters are used for both industrial and domestic purposes, the mandatory limits for the toxic constituents as set forth in the U. S. Public Health Service Drinking Water Standards should apply. The large number of specific quality requirements of water for industrial use prohibits inclusion of a classification for industrial waters in this report.

TABLE 8

RATING OF WATER FOR DOMESTIC AND IRRIGATION USES

Factor or constituent	Rating*		
	Suitable	Marginal**	Inferior
		DOMESTIC	
Total dissolved solids (TDS), ppm	Less than 1,000	1,000-1,500	Greater than 1,500
Nitrate (NO_3), ppm	Less than 45	--	Greater than 45
Fluoride (F), ppm	Less than 1.0	1.0-1.5	Greater than 1.5
Sulfate (SO_4), ppm	Less than 250	250-500	Greater than 500
		IRRIGATION	
Electrical conductivity $EC \times 10^6$ at 25° C	Less than 1,500	1,500-3,000	Greater than 3,000
Chloride (Cl), ppm	Less than 175	175-350	Greater than 350
Percent sodium	Less than 60	60-75	Greater than 75
Boron (B), ppm	Less than 0.5	0.5-2.0	Greater than 2.0

*These ratings are a general guide only. Interim standards for certain mineral constituents have been adopted by the California State Board of Public Health for domestic water supplies. Persons planning to serve water to the public should contact their local health department.

**The term marginal applies to waters that exceed the drinking water standards but could be used with appropriate restrictions. For irrigation uses, the term marginal is regarded as possibly being harmful for certain crops under certain conditions of soil or climate, particularly in the higher ranges of this class.

CHAPTER V. GEOHYDROCHEMISTRY

Geohydrochemistry is the study of the chemical quality of surface and ground water as it is influenced by the geologic and hydrologic environments and modified by the activities of man.

As has been generally recognized, the principal conditions that influence the kind and concentration of chemical constituents occurring naturally in surface and ground water are: (1) climatic conditions, such as the amount of precipitation and runoff -- a part of the hydrologic environment; and (2) chemical composition of the rocks that water encounters and the weathering process these rocks undergo -- a part of the geologic environment.

Among the major factors resulting from man's activities which may influence the chemical quality of water in the San Diego Region are: importation of Colorado River water, future use of Northern California water, use of reclaimed waste water and desalinized water, intrusion of sea water, invasion by connates, development of adverse salt balance condition, disposal of industrial and domestic waste, and application of chemical fertilizers.

EFFECTS OF PRECIPITATION AND RUNOFF

The geology and hydrology of the study area not only individually influence the water quality, but also influence each other in their effects upon it. For example, above normal precipitation and consequent above normal runoff generally result in reducing the concentration of the chemical constituents dissolved in runoff and eventually in ground water. The greater the precipitation, the greater is the effect of dilution. The greater the runoff, the shorter the time water is in contact with the underlying rocks and, therefore, the smaller the concentration of material that is taken into solution by surface water.

Precipitation has a very small quantity of material in solution because it has gone through a natural distillation process during evaporation from water and land surfaces. With respect to total dissolved solids content, precipitation is at one end of the scale and sea water is at the other. In other words, the total dissolved solids content is at a minimum in precipitation, increases during runoff, further increases in ground water, and reaches its maximum in sea water.

Precipitation, which acquires chemical substances while still in the atmosphere, dissolves relatively large quantities of carbon dioxide and smaller amounts of other constituents. Carbon dioxide in combination with rainwater forms carbonic acid, a weak acid that greatly aids in dissolving the minerals which make up the rocks of the lithosphere. The quantities of constituents that water can dissolve depend mainly on the solubility of the rock and soil materials and the length of time the water is in contact with them.

After entering the soil and rocks, precipitation, which generally contains less than 10 ppm total dissolved solids, incorporates soluble constituents, both inorganic and organic. It derives additional carbon dioxide from humus and other sources.

The influence of precipitation on the rocks in the mountain-valley section is far greater than that in the coastal-plain section because of two major factors: (1) annual precipitation for the mountain-valley section ranges from about 15 inches on the lower slopes up to 45 inches on the summits, whereas precipitation on the coastal plain is generally less than 15 inches; and (2) the area of the mountain-valley section is much more extensive than that of the coastal plain and consequently receives more precipitation.

EFFECTS OF GEOLOGIC ENVIRONMENT

The major factors of the geologic environment which influence the chemical quality of natural waters within the San Diego Region are discussed in this section. Also discussed are the techniques used for determining these effects and the evaluation of these effects.

Factors Influencing Water Quality

The principal factors within the geologic environment which influence the constituents dissolved in surface and ground water are the chemical composition of the rocks and weathering processes which these rocks undergo and, to a lesser degree, the natural discharge of hot springs.

Weathering and Rock Composition

Water is a powerful weathering agent, especially when charged with carbon dioxide from the atmosphere and from humus of the lithosphere. Over a period of time, under a climatic environment such as in the mountain-valley section of the San Diego Region, water is able to break down nearly all rock-forming minerals. The products of weathering can be divided into two groups: (1) soluble materials (that is, compounds of sodium, calcium, magnesium, and potassium) which are removed by circulating waters; and (2) residual materials (that is, alumina, iron oxides, and some silica) that accumulate at the site of weathering.

In the San Diego Region, the major crystalline rocks, as discussed in Chapter II, are tonalites, granodiorites, gabbros, and metamorphics. The chemical composition of these rocks was studied in detail by Larsen (1948). Their major chemical constituents are the oxides of silicon, aluminum, iron, calcium, sodium, and potassium. See correction sheet in front of book.

The dissolved constituents accumulated by runoff draining the crystalline mountainous areas of the Region are of relatively low concentration. They are largely derived from feldspathic materials and, to a lesser degree, from the ferromagnesian minerals which make up the crystalline rocks. The four major cations derived from these minerals which are normally found in natural waters, in general order of decreasing abundance, are calcium, sodium, magnesium, and potassium.

This relative order of abundance of cation concentration in waters of the San Diego Region is generally in close correlation with the source minerals which make up the rocks of the Region. This correlation is shown when the oxides of calcium, sodium, magnesium, and potassium are converted to their ionic form (see following section on Techniques Utilized in Evaluating Effects) from the average mineral analyses of rocks (Larsen, 1948).

The stability, or weathering characteristics, of the rock-forming minerals is also important in determining the rate they go into solution. For example, the ferromagnesian minerals break down more rapidly than do the feldspars. Of the feldspars, those rich in calcium and sodium weather more rapidly than do those that are rich in potassium. Therefore, calcium is generally the most abundant cation in the native waters of the San Diego Region.

Even though potassium is one of the four major cations in waters of the Region, it is the least abundant. It generally is present in concentrations of less than 10 ppm. Based on the chemical composition of the crystalline rocks, it should be of a higher concentration in the waters. This anomaly is probably due in large part to the relative solubilities of the major cations, adsorption of potassium ions from solution by clayey materials, and other complex physiochemical processes.
See Correction Sheet in front of book

Adsorption is the adhesion (by physical or chemical forces) of molecules of gases or of ions or molecules in solution to the surface of solid bodies with which they are in contact. Adsorption by the forces of chemical bonding rather than physical forces is termed chemisorption. Replacement of adsorbed ions by ions in solution is termed ion exchange. Most of the ion exchange reactions involve cations and are often referred to as base exchange (Hem, 1959). Adsorption is an important process in the removal or replacement of ions in waters of the San Diego Region.

Generally, calcium and magnesium ions in solution will replace adsorbed sodium on the exchange material as in a water softener system. However, the process is reversible as in the intrusion of a freshwater zone by sea water in which calcium and magnesium ions are released from their exchange positions and replaced by sodium ions.

During the weathering processes, potassium ions are adsorbed by clays and recombined to form new clay or micalike minerals; whereas, a relatively higher proportion of the ions of calcium, sodium, and magnesium tend to remain in solution. Minerals and sediments having exchange capacity are widespread and abundant. Their role in altering the chemical composition of dissolved constituents in water is very important.

Hot Springs

Hot springs locally have a major influence on the ground water in the San Diego Region. Widely scattered, mineralized hot springs are generally associated with fault zones. The hot springs contain highly mineralized waters, which rise from great depths and mix with circulating ground waters of meteoric origin. This mixture, which may move laterally as well as vertically, is generally a moderately hot water containing relatively high concentrations of fluoride, boron, sodium, chloride, and sulfate.

Hot springs, such as Murrieta Hot Springs and San Juan Hot Springs, are characterized by : (1) a Na Cl character, (2) a pH ranging from 9 to 9.4, (3) a high concentration of fluoride ion (4 to 8 ppm), (4) a high percent sodium (about 96 percent), along with a carbonate ion (CO_3) concentration of 20 to 60 ppm, and (5) a TDS concentration of 300 to 750 ppm. These chemical characteristics of waters from hot springs are quite different from those of the ground water in the surrounding areas. The influence of hot springs on the ground water of the areas surrounding Murrieta Hot Springs is indicated on Plates 11A, 12A, and 13A. Ground waters which seem to be partially influenced by hot springs occur in other areas such as those in the vicinity of the community of Radec.

Techniques Utilized in Evaluating Effects

The chemical relationships between ground water and its enveloping geologic environment were studied using the following techniques:

1. Available chemical analyses of ground waters from the wells located in a particular rock type were selected on the basis of the areal geology and subsurface lithology maps.

2. Of the selected chemical analyses, any analysis which had a nitrate ion content generally greater than 5 parts per million was excluded because of probable influences of man.

3. From these selected chemical analyses, percent reactance values of ground water as related to its source host or rock were plotted on trilinear diagrams (Figures 8A, 8B, and 8C).

4. Percent reactance values for chemical analyses of ocean water, Murrieta Hot Springs, and Warner Hot Springs were also plotted on the trilinear diagrams for comparison.

5. For reference and comparison, rock chemical analyses were also plotted on the same diagrams. The same method of calculating the percent reactance value from the chemical analysis of ground water was also used for the chemical analyses of the following rock materials:

Average Woodson Mountain granodiorite (Larsen, 1948)
Average granodiorite (Daly, 1933)
Average Green Valley Tonalite (Larsen, 1948)
Average Bonsall Tonalite (Larsen, 1948)
Average quartz diorite (Daly, 1933)
Average San Marcos Gabbro (Larsen, 1948)
Average gabbro (Daly, 1933)
Temecula Arkose (Mann, 1955)

The plotting of water quality data on trilinear diagrams is a graphic method of presenting the chemical character of a water. Percent reactance values for either cations or anions or both were plotted on the trilinear diagrams. Each vertex represents 100 percent of a particular ion or combination of ions. The composition of the water with respect to cations or anions or both is indicated by a point plotted in its respective triangle on the basis of the percentages of the constituents present. The trilinear diagram (after Piper, 1944) represents an analysis plotted by three points. The cation and anion triangles occupy positions at the lower left and lower right with their bases aligned horizontally. The central portion of the diagram or third portion is the diamond-shaped upper field.

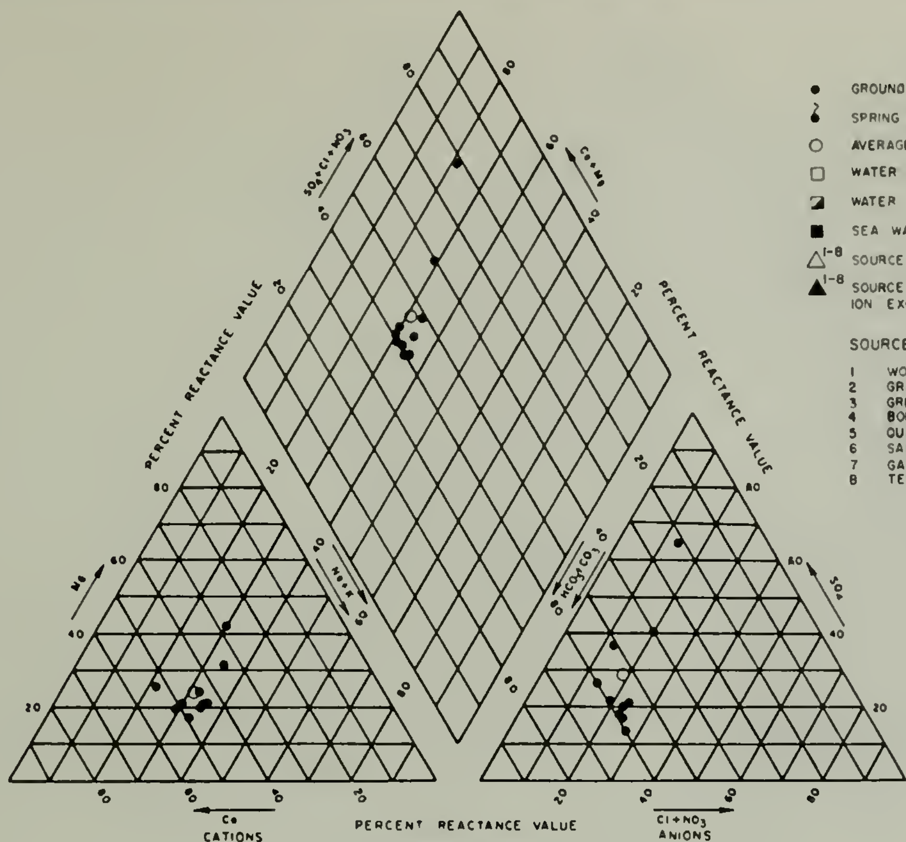
Each corresponding point in the cation and anion triangles is projected into the upper diamond-shaped field along a line parallel to the upper margin of the field. The point where the extensions intersect represents the composition of the water as shown by the relationships between the cations (sodium plus potassium and calcium plus magnesium) and the anions (carbonate plus bicarbonate and chloride plus sulfate). Thus, the chemical character of a water is visually illustrated by the use of trilinear diagrams.

The chemical character which would be expected from a water coming in contact with a given rock type is based on the cation chemical character of that rock. This character is determined from the percent by weight of the oxides of calcium (CaO), magnesium (MgO), sodium (Na_2O), and potassium (K_2O) as presented in the chemical analyses of that rock. However, the resulting cation chemical character does not take into consideration such factors as adsorption, weathering, and solubility of constituents which make up the lithosphere.

To determine the cation chemical character of a rock, the percent by weight of the oxides of the major cations found in water (i.e., Ca, Mg, Na, and K) is changed to its percent by weight in ionic form by multiplying by the following conversion factors: $\left(\frac{\text{atomic weight}}{\text{molecular weight}}\right)$ $\frac{Ca}{CaO} = 0.7146$; $\frac{Mg}{MgO} = 0.6032$; $\frac{Na}{Na_2O} = 0.7419$ and $\frac{K}{K_2O} = 0.8320$. The ionic form of the cations is then equated to parts per million and converted to equivalents per million by dividing by the combining weights of calcium (20.04), magnesium (12.16), sodium (22.99), and potassium (39.10). The percent reactance value for each cation is then obtained by dividing each of the cations in equivalents per million by the sum of the cations to show the cation chemical character. See correction sheet in front of book.

The chemical character of water coming in contact with sedimentary rocks may be estimated by converting mineral analyses of these rocks to their chemical analyses form and then using the above procedures. This technique is useful not only for showing and interpreting relationships with the aid of trilinear diagrams, but also for estimating the cation chemical character of runoff and ground water coming in contact with a given rock type.

However, the cation chemical character which might be expected to occur in a water (based on a chemical analysis of its associated rock material), as previously discussed, is modified by the geologic and hydrologic environments. Chemical analyses indicate that some of the crystalline rocks in the San Diego Region are relatively high in potassium. Therefore,



LEGEND

CHEMICAL ANALYSES OF

- ● GROUND WATER FROM SOURCE ROCK
- SPRING WATER FROM SOURCE ROCK
- ○ AVERAGE DETERMINATION OF WATER FROM SOURCE ROCK
- □ WATER FROM MURRIETA HOT SPRINGS
- WATER FROM WARNER HOT SPRINGS
- ■ SEA WATER
- △[1-8] SOURCE ROCK-CATION DETERMINATION
- ▲[1-8] SOURCE ROCK-CATION DETERMINATION, POTASSIUM ION EXCLUDED FROM CALCULATIONS

SOURCE ROCKS (AS PER SUPERSCRIPTS 1-8)

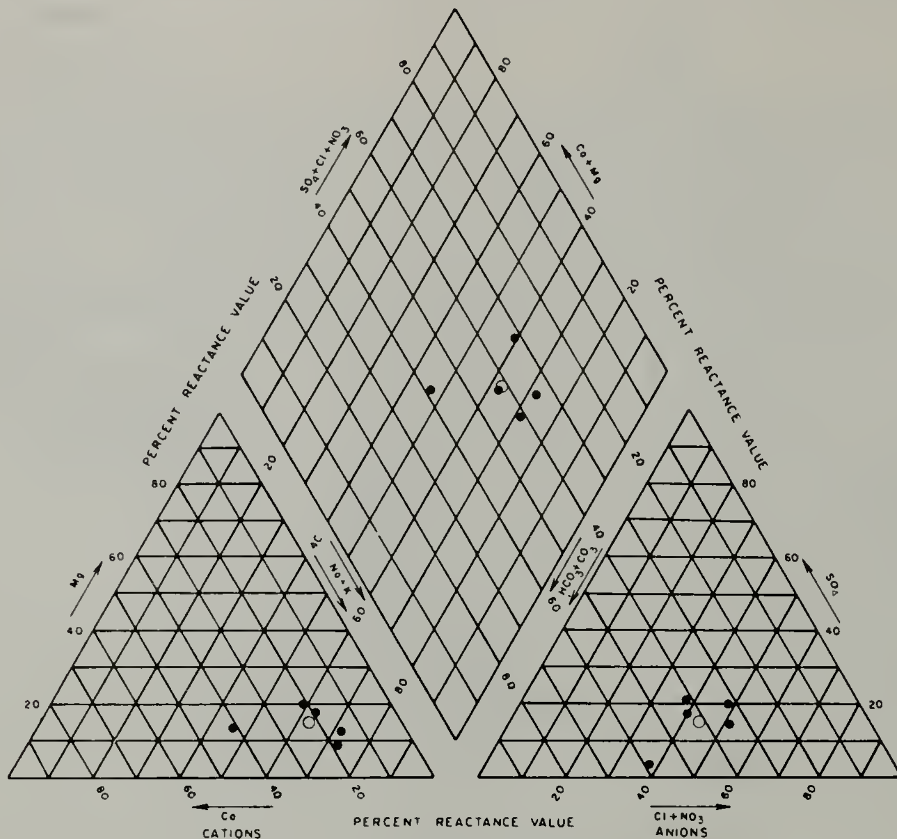
1. WOODSON MOUNTAIN GRANODIORITE
2. GRANODIORITE-WORLD AVERAGE
3. GREEN VALLEY TONALITE
4. BONSALL TONALITE
5. QUARTZ DIORITE (TONALITE)-WORLD AVERAGE
6. SAN MARCOS GABBRO
7. GABBRO-WORLD AVERAGE
8. TEMECULA ARKOSE

PALA FANGLOMERATE

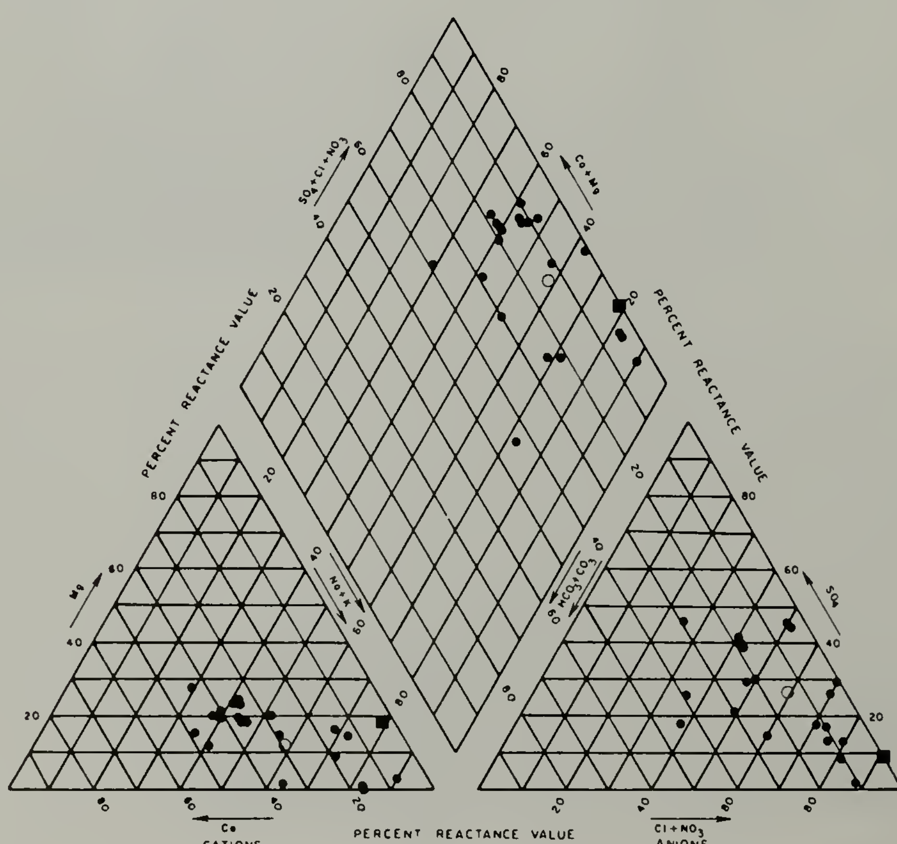
FIGURE 8A

TRILINEAR DIAGRAMS SHOWING CHEMICAL RELATIONSHIP BETWEEN PLEISTOCENE SEDIMENTS AND EXTRACTED WATER

TEMECULA ARKOSE



POWAY CONGLOMERATE



LA JOLLA FORMATION

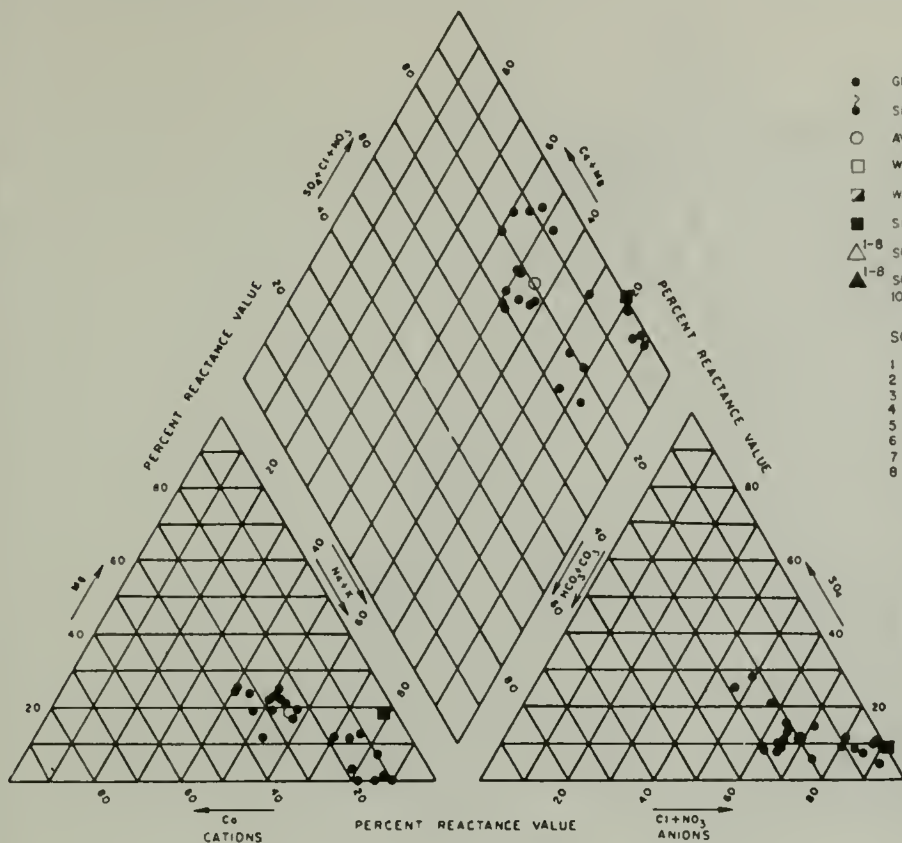
LEGEND

CHEMICAL ANALYSES OF

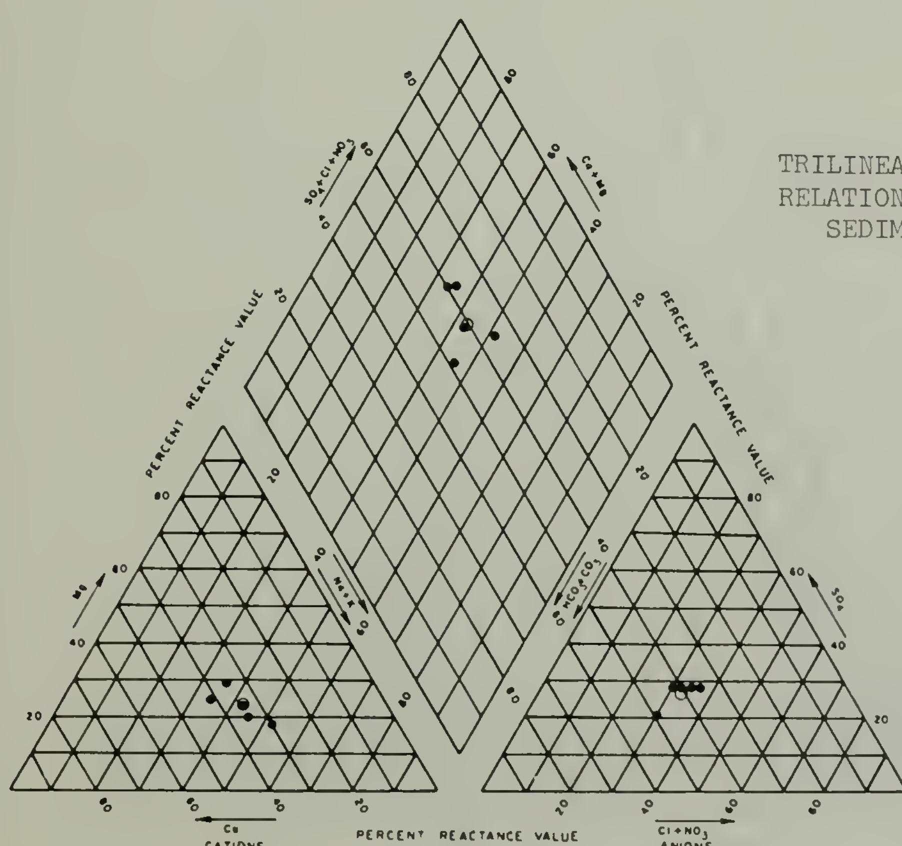
- ● GROUND WATER FROM SOURCE ROCK
- SPRING WATER FROM SOURCE ROCK
- ○ AVERAGE DETERMINATION OF WATER FROM SOURCE ROCK
- □ WATER FROM MURRIETA HOT SPRINGS
- WATER FROM WARNER HOT SPRINGS
- ■ SEA WATER
- △[1-8] SOURCE ROCK-CATION DETERMINATION
- ▲[1-8] SOURCE ROCK-CATION DETERMINATION, POTASSIUM ION EXCLUDED FROM CALCULATIONS

SOURCE ROCKS (AS PER SUPERSCRIPTS 1-8)

1. WOODSON MOUNTAIN GRANODIORITE
2. GRANODIORITE-WORLD AVERAGE
3. GREEN VALLEY TONALITE
4. BONSALL TONALITE
5. QUARTZ DIORITE (TONALITE)-WORLD AVERAGE
6. SAN MARCOS GABBRO
7. GABBRO-WORLD AVERAGE
8. TEMECULA ARKOSE



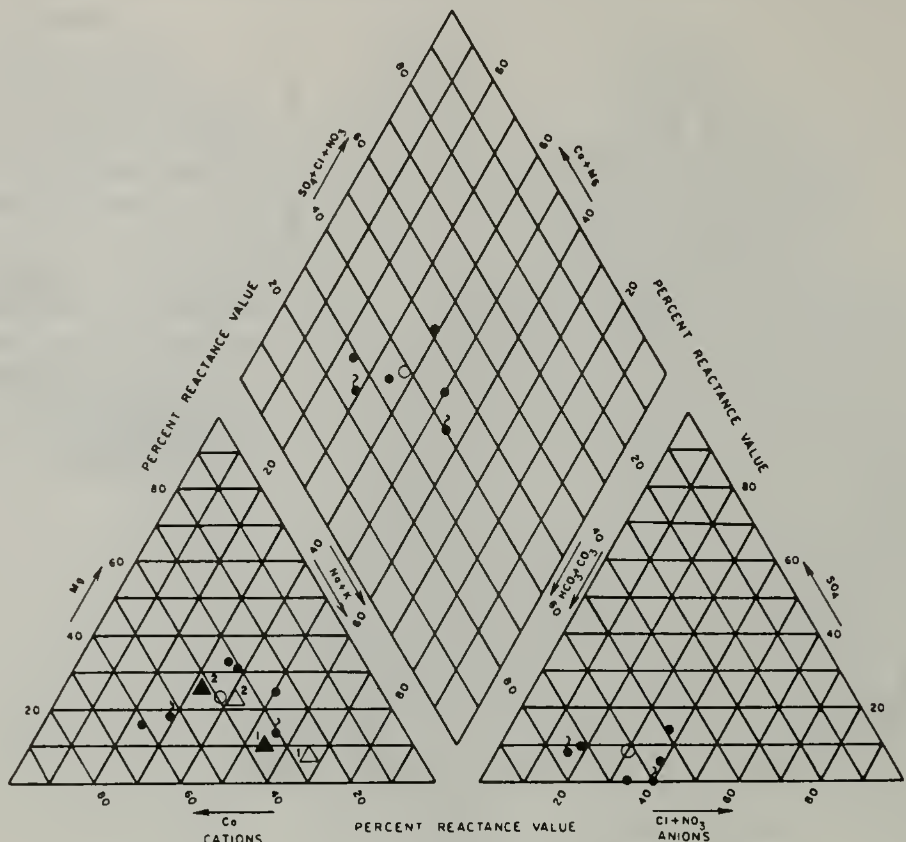
SAN DIEGO FORMATION



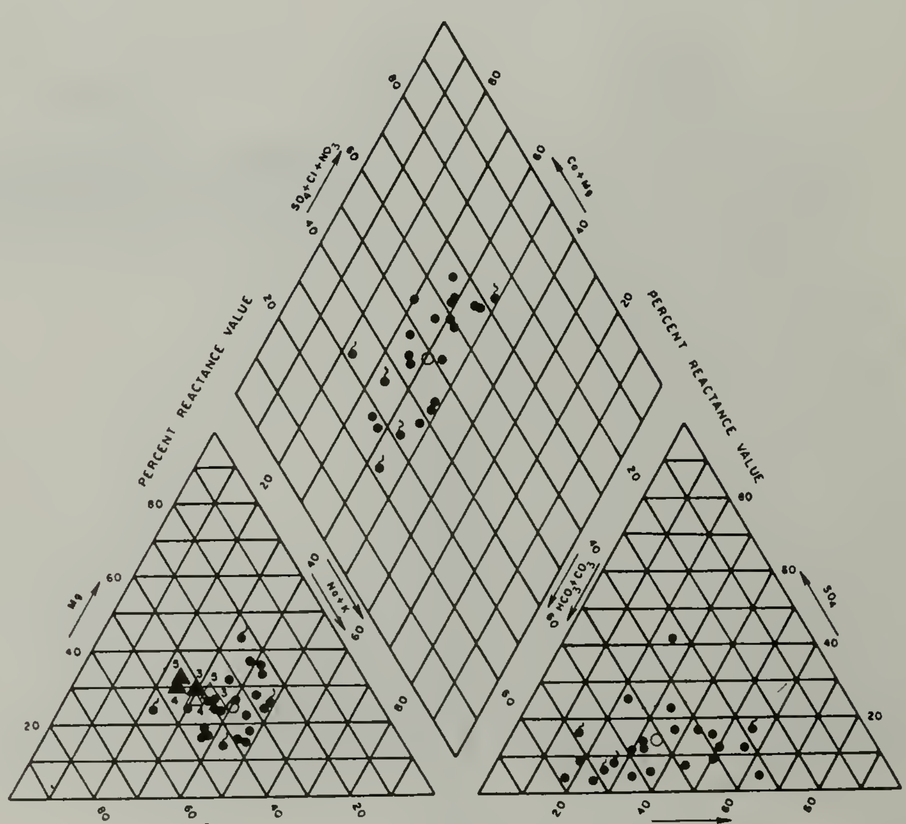
CAPISTRANO AND/OR SAN MATEO FORMATIONS

FIGURE 8B

TRILINEAR DIAGRAMS SHOWING CHEMICAL RELATIONSHIP BETWEEN PRE-QUATERNARY SEDIMENTS AND EXTRACTED WATER



GRANODIORITE



TONALITE

DEPARTMENT OF WATER RESOURCES, SOUTHERN DISTRICT, 1966

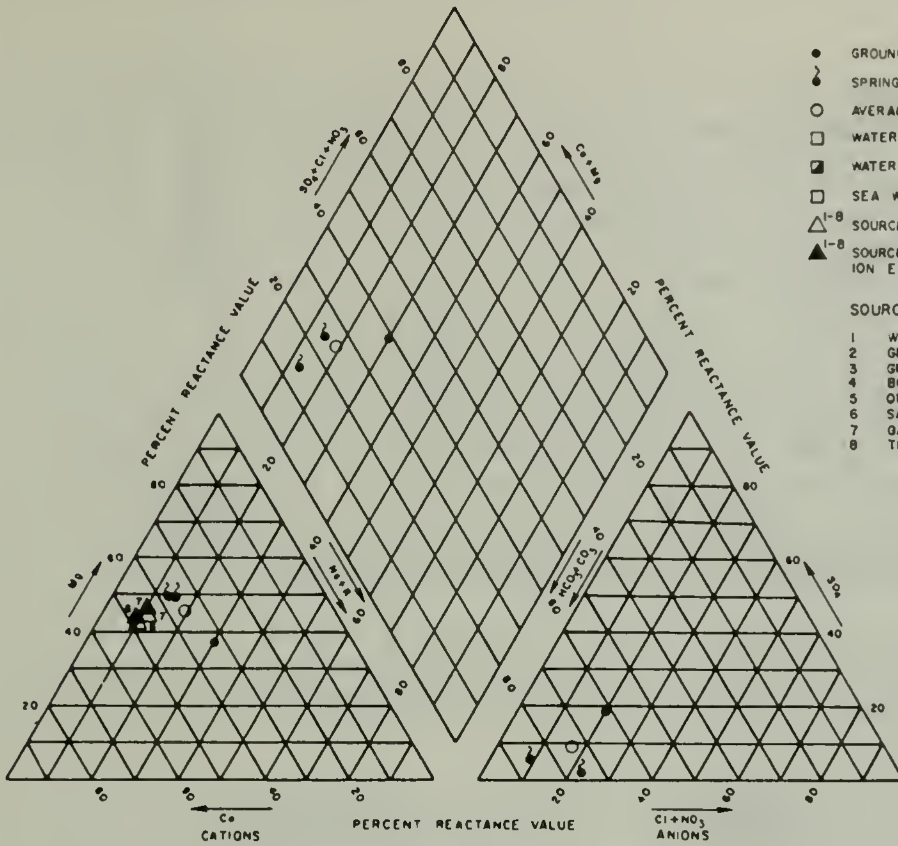
LEGEND

CHEMICAL ANALYSES OF

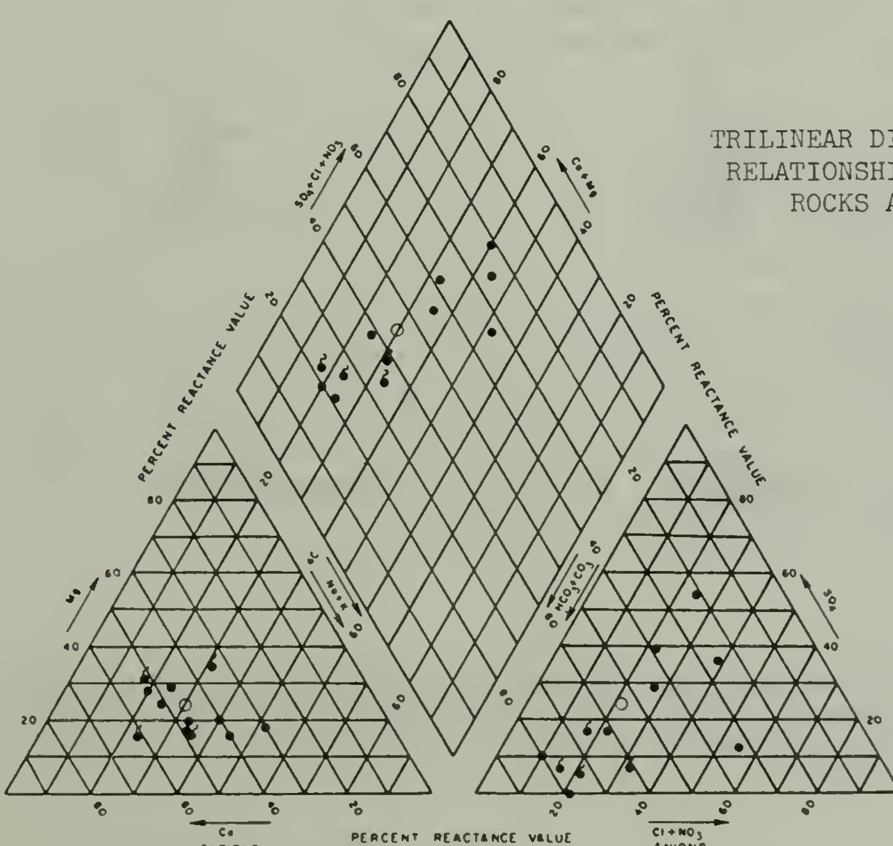
- ● GROUND WATER FROM SOURCE ROCK
- SPRING WATER FROM SOURCE ROCK
- ○ AVERAGE DETERMINATION OF WATER FROM SOURCE ROCK
- □ WATER FROM MURRIETA HOT SPRINGS
- ◪ WATER FROM WARNER HOT SPRINGS
- □ SEA WATER
- △[1-8] SOURCE ROCK-CATION DETERMINATION
- ▲[1-8] SOURCE ROCK-CATION DETERMINATION, POTASSIUM ION EXCLUDED FROM CALCULATION

SOURCE ROCKS (AS PER SUPERSCRIPTS 1-8)

1. WOODSON MOUNTAIN GRANODIORITE
2. GRANODIORITE-WORLD AVERAGE
3. GREEN VALLEY TONALITE
4. BONSALL TONALITE
5. QUARTZ DIORITE (TONALITE)-WORLD AVERAGE
6. SAN MARCOS GABBRO
7. GABBRO-WORLD AVERAGE
8. TEMECULA ARKOSE



GABBRO



METAMORPHIC ROCKS

FIGURE 8C

TRILINEAR DIAGRAMS SHOWING CHEMICAL RELATIONSHIP BETWEEN CRYSTALLINE ROCKS AND EXTRACTED WATER we might expect waters associated with these rocks also to be high in potassium. However, as has been previously explained, this is not the case. In fact, nearly all naturally occurring waters in the San Diego Region are so low in potassium that this ion is not significant in determining the chemical character of a water.

Employing this technique for estimating the cation chemical character of a water coming in contact with a given rock type, the following estimations were made: (1) magnesium-calcium for the San Marcos Gabbro, (2) sodium-calcium for the Green Valley Tonalite, (3) sodium-calcium for the Woodson Mountain Granodiorite, and (4) calcium-sodium for the Temecula Arkose. However, it should be noted that the sodium and calcium ion concentrations for (2), (3), and (4) above are, on the average, nearly equal with magnesium being higher in the tonalite.

The bicarbonate ion, which is largely derived from carbon dioxide in the atmosphere and from humus in the lithosphere, is generally the predominant anion in waters associated with these rocks.

A comparison of the distribution of TDS values for ground water from various rock types is shown on Figure 9. These graphs are based on nearly 400 chemical analyses of ground water, some of which have been influenced to some degree by man's activities, and therefore are not as selective as those used in preparing Figures 8A, 8B, and 8C.

Figure 9 indicates that, in general, ground water from the continental sediments (Pala Fanglomerate, Temecula Arkose, and Pauba Formation) has a TDS concentration which usually falls within the range of 200 to 600 ppm. In contrast, ground water from the San Diego, Capistrano, San Mateo, and La Jolla Formations and from the Poway Conglomerate generally has a TDS concentration falling within a range of 400 to 2,000 ppm. The higher TDS range for these sediments of marine origin is attributable to their connate waters which have been subsequently flushed out to varying degrees. Ground water extracted from the fractured, jointed, and weathered crystalline rocks (granodiorites, tonalites, gabbros, and the metamorphic rocks) has a TDS concentration that generally falls within a range of 150 to 700 ppm.

Evaluation of Effects

Using the techniques described in the preceding section to evaluate the effects of the major sedimentary and crystalline rocks on the chemical quality of ground water, the following findings were made:

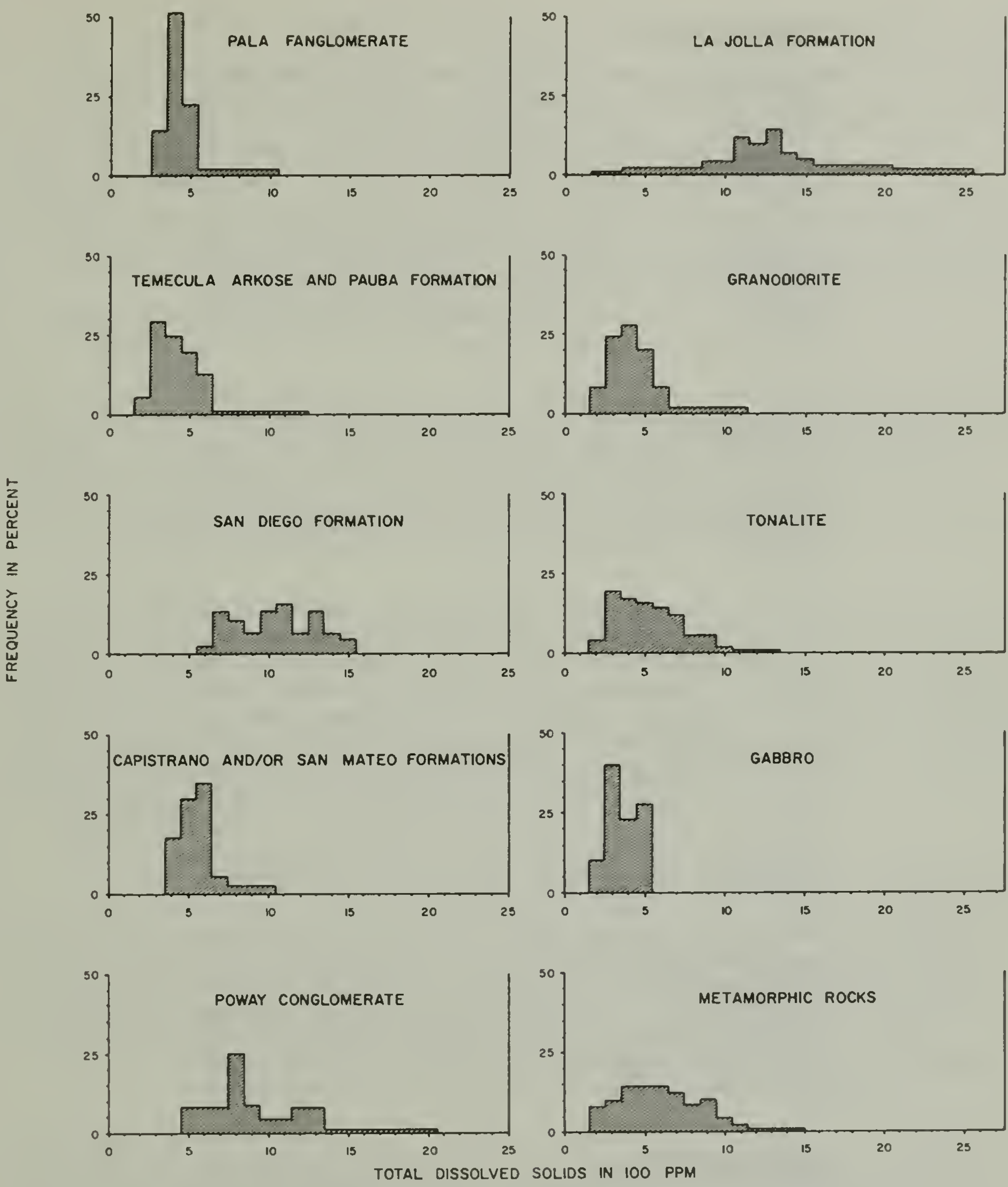


Figure 9

TOTAL DISSOLVED SOLIDS IN GROUND WATER FROM MAJOR ROCK TYPES

DEPARTMENT OF WATER RESOURCES, SOUTHERN DISTRICT, 1966

Sedimentary Rocks

Chemical analyses of the ground water from six sedimentary units are discussed in this section. Ground water from alluvium in the Region is excluded from this discussion because its chemical characteristics are variables which largely depend upon the watershed environment and local conditions resulting from man's activities. The six sedimentary rocks presented in this section to show the relationship of ground water to its host rock are as follows: Pleistocene Sediments -- Pala Fanglomerate and Temecula Arkose; pre-Quaternary Sediments -- San Diego Formation, Capistrano and San Mateo Formations, Poway Conglomerate, and La Jolla Formation.

Pala Fanglomerate. Ground water extracted from the Pala Fanglomerate in the Pala-Pauma Valley area is generally calcium-sodium bicarbonate in character and has a TDS content of 200 to 500 ppm. The average TDS of 10 selected chemical analyses shown on Figure 8A is 420 ppm. The range is plotted in Figure 9.

The trilinear plot of the average chemical analysis of the cations and anions of ground water from the Pala Fanglomerate exactly matches that of the average chemical analysis of ground water in the metamorphic rocks (Figure 8B). Also, the cation plot of ground water from the Pala Fanglomerate is nearly the same as that of the cation plot for the average chemical analysis of Bonsall Tonalite (Figure 8B). This substantiates the geologic evidence that the fanglomerate is slope wash derived primarily from the adjoining metamorphic rocks and Bonsall Tonalite along the Elsinore fault zone in the Agua Tibia Mountains.

Locally, the relatively high content of sulfate ion in ground water derived from the Pala Fanglomerate is probably a result of oxidation of sulfide minerals associated with the crystalline rocks of the surrounding terrain. However, a portion of the sulfate ion may possibly be a result of chemical fertilizers applied to the extensive agriculture areas.

Temecula Arkose. The Temecula Arkose occurs in the Temecula-Murrieta, Aguanga-Radec, and Warner Springs-Lake Henshaw areas. Analyses of ground water from 15 wells (also includes water from Pauba Formation) indicate that, although variable, the average chemical character is sodium bicarbonate (Figure 8A). This average is somewhat misleading because of the influence of Murrieta Hot Springs which is sodium chloride in character. A significant observation from the trilinear diagram is that the plot of cations from the rock analysis of the Temecula

Arkose is calcium-sodium (nearly equal percent reactance value) in character which also should be the character of ground water associated with the Temecula Arkose if the hot springs did not have an influence. Locally, the relatively high sulfate content is in part due to the effects of Warner Hot Springs which is sodium sulfate-chloride in character.

The total dissolved solids concentration generally ranges from 200 to 600 ppm with several analyses exceeding the upper value. The average TDS of 15 chemical analyses shown on the trilinear diagram (Figure 8A) is 500 ppm. The range of TDS is shown graphically in Figure 9.

San Diego Formation. The sediments of the San Diego Formation crop out extensively in the coastal plain section south of the San Diego River, with thick beds being found in Otay Mesa. Chemical analyses of ground water from 22 wells indicate the waters are sodium chloride in character (Figure 8B). The total dissolved solids content generally ranges from 600 ppm to 1,600 ppm and averages about 950 ppm (Figure 9).

The sodium chloride character of the ground water and its relatively high TDS is indicative of the marine origin of the San Diego Formation. Its connate water has only been partially flushed out by meteoric water. Chemical analyses of water from several wells located in the mesa south of the Otay River show an unusually high fluoride content (2 ppm to 5 ppm). The source of the fluoride ions may be the bentonitic tuff beds intercalated in the San Diego Formation.

Capistrano and San Mateo Formations. Cropping out in the area around San Mateo and San Juan Capistrano, these locally water-bearing sediments are limited in extent. Selected data from five wells indicate that the average chemical quality of this water is variable. The water is sodium-calcium bicarbonate-chloride in character (Figure 8B) with an average total dissolved solids content of about 500 ppm (Figure 9). The bicarbonate-chloride character of this water reflects partial flushing of the connate water from these formations.

Poway Conglomerate. A widely distributed sediment in the coastal plain north of San Diego, the Poway Conglomerate is locally water-bearing. Analyses of ground water from four wells indicate the chemical character generally to be sodium chloride-bicarbonate or bicarbonate-chloride (Figure 8B) with a total dissolved solids content generally ranging from 600 ppm to 1,200 ppm. A fifth well with a TDS of 400 ppm is sodium-calcium bicarbonate in character. Figure 9 indicates that the

TDS averages about 800 ppm. Ground water from the Poway Conglomerate (in part marine) appears to be partially flushed connate water as shown by the predominance of sodium and chloride ions associated with the bicarbonate ion and the variability of the total dissolved solids concentration.

La Jolla Formation. Occurring in the coastal plain section, the La Jolla Formation extends northerly from the San Diego River to the San Mateo Creek. Chemical analyses of ground water from 21 wells located in the mesa area between the San Dieguito and San Diego Rivers indicate an average chemical character of sodium chloride (Figure 8B). However, the chemical character of the water is variable, with calcium, bicarbonate, and sulfate ions also being locally prevalent. The total dissolved solids content averages about 1,400 ppm but generally falls within a range of 800 ppm to 2,200 ppm, with some exceptions as shown on Figure 9. As indicated by the average chemical character and variable high TDS, this water is a connate of marine origin which subsequently has been partially flushed by meteoric water. The locally occurring, relatively high sulfates probably indicate the influence of gypsiferous deposits in the La Jolla Formation.

Crystalline Rocks

Chemical analyses of ground water associated with igneous and metamorphic rocks are discussed in this section. Ground water derived solely from residuum is excluded from this presentation. The chemical characteristics of ground water from residuum, like that from alluvium, are variables which depend in large part upon the local environmental conditions resulting from man's activities. However, wells drilled into the crystalline rocks usually penetrate some residuum. The chemical quality of ground water collecting in the fractures and joints of the unweathered crystalline rocks is affected to some degree by overlying residuum which itself has been subjected to the influence of man's activities. The relationship of the chemical quality of ground water to its host rock (granodiorites, tonalites, gabbros, and metamorphic rocks) was evaluated as follows:

Granodiorite. Ground water extracted from the Woodson Mountain Granodiorite (five samples) is sodium to calcium or calcium to sodium bicarbonate in character, as shown by the trilinear diagram (Figure 8C). The average TDS of these samples is 240 ppm, but Figure 9 shows TDS values concentrated within a range of 150 ppm to 650 ppm. The higher values probably reflect the influence of man's activities on the ground water which has percolated through the overlying residuum into fractures and joints in the granodiorites.

A plot of the average cations for this granodiorite is nearly coincident with a plot of the cations of the average world composition of granodiorite (Figure 8C). However, a plot of the average ground water associated with the Woodson Mountain Granodiorite is richer in calcium than a plot of the chemical analysis of Woodson Mountain Granodiorite itself. This may be because the calcium-rich feldspars weather more readily than the sodium-rich feldspars and, therefore, the ground water is richer proportionally in calcium ion than is the host rock.

Another possible explanation for the variation in chemical makeup is the mineral composition of the granodiorites. These rocks are somewhat heterogeneous due to the inclusions of dark-colored xenoliths which are calcium-rich in composition.

Tonalite. The chemical character of ground water extracted from the tonalites is variable, as shown in Figure 8C, with the anion group showing a greater spread than the cation group.

The average chemical character of ground water from 23 selected wells is sodium-calcium bicarbonate; however, the ions of magnesium and chloride are also fairly common in various combinations with the ions of sodium, calcium, and bicarbonate. The total dissolved solids content ranges from 150 ppm to 550 ppm, averaging about 360 ppm for the same 23 wells; however, a greater spread is shown on Figure 9. The wide variation in TDS and chemical character is due in part to the numerous inclusions within the tonalites.

As shown in Figure 8C, the average cation plot of ground water associated with tonalites is very similar to the average cation plot derived from chemical analysis of tonalites, but has a slightly higher sodium percent reactance value.

In addition, sodium as well as chloride ions in the ground water probably reflect the influences of man's activities and hot springs.

Gabbro. Ground water extracted from the gabbroic rocks, as shown by the plot of the chemical analyses of three selected samples (Figure 8C), is magnesium to magnesium-calcium bicarbonate in character.

The TDS of these samples falls within a range of 160 ppm to 260 ppm and averages 230 ppm. However, as shown on Figure 9, the TDS varies from 150 to 550 ppm for a larger number of samples. The higher values probably reflect, to some degree, the influences of man's activities.

A plot of the cations, based on chemicals analyses of gabbro, indicates a calcium to calcium-magnesium rich rock.

Metamorphic Rocks. The chemical character of ground water extracted from the metamorphic rocks is variable, as shown on Figure 8C, with the anion group showing a greater spread than the cation group.

The average chemical character of ground water from 12 selected wells is calcium-sodium bicarbonate. The total dissolved solids content averaged 380 ppm and ranged from 200 to 700 ppm for these same wells; however, a greater spread is shown on Figure 9.

This large variation in TDS and chemical character may be attributed to the wide range in type and chemical composition of the metamorphic rocks and extensive shear zones associated with secondary mineralization. In addition, outside influences resulting from man's activities are a factor.

In conclusion, it appears that, except for the gabbroic rocks which are magnesium-rich, the cation plots of ground water (Figure 8C) are very similar for granodiorite, tonalite, and the metamorphic rocks. Ground water associated with these three rock types are calcium-sodium to sodium-calcium rich while ground water associated with the gabbroic rocks is magnesium to magnesium-calcium rich. The bicarbonate ion, largely derived from carbon dioxide in the atmosphere and humus in the lithosphere, is generally the predominant ion in waters associated with the crystalline rocks. However, the erratic occurrence of the anions in some of the waters may be largely attributed to the influence of hot springs, sulfide minerals, or man's activities.

EFFECTS OF MAN'S ACTIVITIES

Man's activities have had far-reaching effects on the chemical quality of the water resources of the San Diego Region. The use of supplemental waters by man to sustain his presence in the Region has modified the chemical quality of the native ground water.

The chemical quality of the native ground water has been modified by other activities of man. In fact, it has been impaired through such means as overpumping and poor waste disposal practices. Impairment of the chemical quality of the ground water resources may also occur through the interchange between zones of waters of differing chemical quality by means of improperly constructed, modified, or destroyed wells.

Sources of Ground Water Impairment

Natural degradation of water quality from multiple sources and causes has existed for many years prior to man's development of the ground water resources of the San Diego Region. Under natural conditions, the rocks and soils forming the drainage area of a stream system determine the chemical characteristic of surface runoff and ground water stored in the valley fill. Locally, highly mineralized tributary springs and connate waters increase the quantity of chemical constituents in recipient streams and, consequently, that of the recharged ground water supply.

However, with the advent of man and consequent development of the area, especially in the coastal portion of the San Diego Region, impairment of the ground water supplies commenced. Water quality studies by the Department have brought into focus many of the sources of impairment of ground water quality. Major factors in the impairment of the chemical quality of ground water in the coastal alluvium-filled valleys have been declining water levels and overdraft conditions which have resulted in sea-water intrusion and/or the upward or lateral movement of connate water.

Other possible or potential sources of ground water impairment include injudicious discharge of effluent from developed hot springs; development of adverse salt balance conditions; indiscriminate disposal of industrial and domestic wastes; and application of chemical fertilizers.

Sea Water

Most of the water-bearing sediments along the coast of the Region are in direct contact with the floor of the ocean or an inland bay, that is, in hydraulic continuity. Where this exists, sea-water intrusion is a present or potential threat to the associated ground water reservoirs. Before these reservoirs were exploited, a seaward hydraulic gradient existed, and excess fresh water from inland areas escaped from springs near the beaches or from submarine springs off the coast. Before 1900, use of ground water supplies was relatively limited in California. However, rapid development in the use of ground water since then has created many serious problems, including overdraft and sea-water intrusion.

Since 1944, a continued ground water overdraft, due to increasing agricultural, municipal, and industrial demands, and to persisting drought, has lowered ground water elevations below sea level along the seaward margins of many alluvium-filled valleys. The accelerated development of these ground water reservoirs within the last 20 years has, in some instances, lowered the water table or piezometric surface to the extent that the natural seaward freshwater hydraulic gradient has been reversed. As a result of this ground water overdevelopment, the safe yield of the reservoirs has been exceeded and sea water has intruded. Thus, extensive damage and large economic losses have occurred.

Examples of sea-water intrusion are in the coastal portions of the San Dieguito and Tia Juana River Valleys (Plate 7). The ground water is sodium chloride in character with a TDS concentration greater than 2,000 ppm. (See Plates 9 and 10).

Connate Waters

Poor quality connate waters occur in some of the Tertiary marine sediments in the coastal portion of the Region. These waters may occur at depth in the sediments underlying the alluvial deposits and in the sediments occurring in the coastal mesa areas. In general, connate waters have been partially flushed out by meteoric waters, resulting in a decreased TDS concentration. For example, around the City of San Diego ground water extracted from the San Diego Formation is sodium chloride in character and generally has a TDS concentration of about 600 to 1,600 ppm.

North of the City of San Diego, similar connate waters occur in the La Jolla Formation, which produces ground water predominant in sodium chloride generally with 800 to 2,200 ppm total dissolved solids. Connate waters held in the interstices of marine sediments and sealed in by deposition of overlying beds may appear in water pumped from deep wells. Or it may appear in water pumped from wells where overdraft has caused freshwater levels to decline sufficiently to allow connate waters to migrate from the adjacent marine sediments.

In the coastal portion of the San Luis Rey River Valley, overdraft conditions (Plate 7) have induced the migration of connates from sediments of the La Jolla Formation.

Hot Springs

In highly faulted areas, hot springs exhibiting high mineralization may flow upon the ground surface. The hot springs in some areas have been developed into mineral baths for health resorts. The chemical concentration of these waters generally exceeds the accepted domestic, irrigation, and industrial standards. If the effluent from the hot springs is discharged injudiciously to streams, it may impair the chemical quality of surface water in the area. The waters may also percolate directly into the alluvial sediments, causing direct impairment of the ground water.

Adverse Salt Balance

Use of water increases the total amount of dissolved solids by evaporation or by the addition of salts. The used water becomes waste water. If it returns to the water supply, the total dissolved solids concentration of the supply is increased. If the return continues indefinitely, the gradual increase caused by reuse and recirculation will eventually result in impairment of the water quality for major beneficial uses.

"Salt balance" is a term that signifies the amount of dissolved salts or constituents in a ground water reservoir in relation to time. If the salts entering the supply exceed those removed, the balance is called "adverse". If the opposite is true, the balance is "favorable". If salt outflow is equal to salt inflow, salt balance is "maintained". Note, however, that it is not related to the quantity of water available from the supply.

The hazards of pollution and contamination of a supply water resulting from reuse or return of waste water depend on the use to which the supply water is put. Impairment of quality of ground water is long lasting and may be permanent if there is no drainage from the ground water reservoir.

Degradation of water quality is further accentuated by adverse salt balance. Adverse salt balance is most pronounced in areas of overdraft where the water supplies are used extensively and in areas where there is little or no replenishment, that is, where little or no movement of ground water from or into the ground water reservoir takes place. In these areas, the salinity caused by even relatively innocuous wastes may build up dangerously over a period of years, thus rendering the ground water increasingly less suitable for beneficial uses. A favorable salt balance can often be maintained by exportation of ground water from the basin, although this could create overdraft conditions.

Multiple use and reuse of ground water increases the danger of adverse salt balance. Percolation of dissolved fertilizers and industrial wastes increases the mineral burden of the water and decreases the possibility of restoring a favorable salt balance. Adverse salt balance in ground water is in marked contrast to adverse salt balance in surface waters in that the impairment of the quality of streams may be alleviated by flood flows or corrected by discontinuing the disposal of specific wastes.

Impairment of ground water quality due to development of adverse salt balance is extremely difficult to ascertain, and long-term records of chemical analyses of many wells are necessary to confirm adverse salt balance conditions. Examples of adverse salt balance conditions in the San Diego Region exist in the Escondido and El Cajon areas.

Industrial and Domestic Wastes

Discharges of industrial and domestic wastes affect the chemical quality and may constitute a source of pollution to the ground water of the San Diego Region. Examples of ground water impairment in the San Diego Region from indiscriminate waste disposal practices are as follows:

Boron. As a result of an investigation to determine possible boron pollution due to the waste disposal operations of two citrus processing and packing plants at Escondido, high boron concentrations were detected locally in both surface and ground water in 1951. The boron was traced to unusually high concentrations (415 - 766 ppm) in unlined waste disposal pits located adjacent to a minor tributary of Escondido Creek. Although the citrus plants have not used the sumps since 1959, the residual effect of the boron-rich percolating waters has persisted in the ground water in the Escondido area, being as much as 5 ppm in several wells. Waters containing concentrations of more than 2.0 ppm are classified injurious to unsatisfactory for irrigation.

Hexavalent Chromium. Discharge of rinse waters to the ground surface and to a cesspool from chrome plating operations resulted in pollution of a portion of the ground water in Murrieta. These discharges, which were halted in March 1956, caused four wells in the immediate vicinity of the waste disposal site to be polluted with hexavalent chromium in concentrations of up to 3 ppm. Eighteen other wells in Murrieta and vicinity contained traces of hexavalent chromium.

Chemical analyses of samples from wells in the immediate vicinity of the site on May 21, 1959, showed that three of the four wells had hexavalent chromium concentrations of 0.12 to 0.35 ppm, which exceeded the Public Health Service

Drinking Water Standards of 0.05 ppm. Although the residual effect of the chromium wastes was evident in 1959, it had decreased considerably from a maximum of 3.0 ppm in 1956.

Water Softener Regeneration Brines. Locally, the disposal of brine wastes from the regeneration of water softeners can constitute a source of excessive contributions of sodium and chloride ions to the ground water. The maximum increase of sodium and chloride in domestic sewage due to the regeneration water softeners is about 280 and 430 ppm, respectively, for each house that has a private softener.

Nitrates. The discharge of domestic wastes through the use of cesspools, septic tanks, and leach lines has locally resulted in high nitrate concentrations throughout much of the San Diego Region. This is especially true where there is a deficiency in precipitation and little ground water movement to flush out the water-bearing materials. In some of the larger, relatively densely populated areas such as Fallbrook, Escondido, Lakeside, and El Cajon, the nitrate ion concentration of ground water from selected wells exceeds the Public Health Service Drinking Water Standards of 45 ppm (Plates 11A and 11B). Between 1951 and 1963, the nitrates varied from 45 to more than 300 ppm from individual wells in these communities. In addition to nitrates being derived from discharges of domestic wastes, the application of chemical fertilizers and the wastes from stock also probably account for nitrates being added to ground water.

Alkyl Benzene Sulfonate (ABS). Locally in the Region, concentrations of alkyl benzene sulfonate (formerly a constituent of most household detergents and commonly known as ABS) have caused foaming both in surface and ground water. However, with the changeover from ABS, a "hard type" detergent, to LAS (linear alkyl sulfonate) a "soft type" detergent which is biologically degradable, foaming has diminished.

As little as 0.5 ppm of ABS in a water supply will cause foaming when the water is drawn from the household tap, especially if the faucet has a screening device to cause agitation. Foam has been observed in such streams as Escondido Creek, San Diego River, and Sweetwater River.

Chemical Fertilizers

In intensively developed irrigated agricultural areas, various types of fertilizer compounds are added to the soil to increase crop production. The application of chemical fertilizers to agricultural lands has at least locally affected the chemical quality of ground water in the San Diego Region. Chemical fertilizers that are now or were extensively used in the past are compounds high in ammonium, sulfate, nitrate, and phosphate. These compounds are primarily used to add nutrients to the root zone in an available form for crop utilization and to condition the soil. Truck crop areas generally utilize 2,000 to 3,000 pounds of fertilizer per acre, per year, whereas orchard areas generally utilize 200 to 300 pounds of fertilizer per acre, per year. The amount of soluble ions that will go into the ground water will depend upon: (1) the crop, (2) tillage practice, (3) type of fertilizer, (4) quantity and quality of applied water, (5) organisms in the soil, (6) climatic conditions, and (7) soil characteristics.

Excess nitrates and sulfates that have been leached from the root zone are carried down into the ground water through irrigation. However, it should be emphasized that nitrates in the ground water of the San Diego Region probably have been derived largely from domestic wastes.

Influences of Supplemental Waters

The influences of supplemental waters must be considered in evaluating the present and future chemical quality of ground water in the San Diego Region. These include present use of imported Colorado River water, potential use of imported Northern California water, greater use of reclaimed waste water, and planned use of desalinized water.

Colorado River Water

The quantity of Colorado River water imported into the San Diego Region since 1947-48 to meet the needs of the area has paralleled the increase in population and industrial growth.

The chemical character of this water is generally calcium-sodium sulfate to sodium-calcium sulfate with a total dissolved solids concentration of 650 to 850 ppm. Imported water is very different chemically from native water in most of the San Diego Region. The historical change in chemical character of water in storage in San Vicente and Sweetwater Reservoirs (Plate 10) clearly shows the influence of Colorado River water on the natural runoff. Not only has the chemical character of water stored in these lakes and reservoirs changed, but the total dissolved solids have also increased threefold. In addition, the importation of this water has locally modified the chemical character of ground water as well as surface water.

Northern California Water

Importation of Northern California water to the San Diego Region will commence in 1972. This water will be diverted from the delta of the San Joaquin-Sacramento Rivers and conveyed to Southern California through canals and pipelines of the State Water Project. Facilities will be constructed to ensure passage of higher quality Sacramento River water across the delta to the point of diversion.

The water quality objectives for water delivered to Southern California from the State Water Project are that, for any 10-year period, water will not exceed the concentrations for total dissolved solids of 220 ppm, total hardness of 110 ppm, chlorides of 55 ppm, sulfates of 20 ppm, and 40 percent sodium. The concentrations of chemical constituents dissolved in the imported water in general will be lower than that found in most ground water in the San Diego Region.

Importation of Northern California water should result in the amelioration of the chemical quality of the water resources of the San Diego Region. However, it should be noted that water is imported to the Region by the San Diego County Water Authority and the Orange County Municipal Water District (San Juan-Trabuco area). These agencies are now delivering Colorado River water obtained from the Metropolitan Water District. The mixture and therefore the quality of imported waters delivered to the Region by these agencies after completion of the State Water Project cannot be described at this time.

Reclaimed Waste Water

The chemical quality of ground water is also affected by discharge of waste water treatment plant effluent. Reclamation of waste water from treatment plants has recently been a subject of discussion in coastal San Diego County (DWR Bulletin No. 80-2). The effluent from waste water treatment plants has been utilized directly or indirectly for irrigation, ground water recharge, and recreation in the Region. The most significant factor affecting the chemical quality of a waste water is the quality of the original supply water. However, because of the addition of chemical constituents through domestic and industrial uses, the chemical content of a waste water is higher than that of the supply water. Conventional waste water treatment does not appreciably affect the chemical quality.

In the coastal portion of the San Diego Region, the major part of which lies within the San Diego County Water Authority service area, about 80 percent of the water supply is Colorado River water. Therefore, the chemical quality of the supply water and the waste water is strongly influenced by the chemical quality of Colorado River water, with varying minor influences from other local sources.

The normal range of increase of chemical constituents by waters used for domestic purposes is presented in Table 9.

The influence of waste water effluents from treatment plants (Plates 10, 11, 12, and 13) clearly appears in surface flow or in ground water in portions of the San Diego River, Tia Juana River, Escondido Creek, San Luis Rey River, and San Dieguito River Valleys. It should be pointed out that most of the waste water treatment plant effluent in the San Diego Region is currently being discharged to the ocean through sewer outfalls. In recent years, however, an increasing number of reclamation projects have adopted planned waste water reclamation practices for recreation, irrigation, and ground water recharge. Among these projects are the well-known recreational lakes at Santee and ground water replenishment facilities at Whelan Lake near Oceanside.

Desalinized Water

As discussed in Chapter III, it is planned to use desalinized water in the south coastal portion of the San Diego Region as a supplemental source of supply, and to blend it with water from other sources.

TABLE 9

INCREASE IN CHEMICAL CONCENTRATIONS
RESULTING FROM DOMESTIC USES*

Constituent	Parts per million	Constituent	Parts per million
TDS	100 - 300	SO_4	15 - 30
Ca	15 - 40	Cl	20 - 50
Mg	15 - 40	N	20 - 40
Na	40 - 70	P	20 - 40
K	7 - 15	B	0.1 - 0.4

*From DWR Bulletin No. 80-2.

CHAPTER VI. WATER RESOURCES OF THE HYDROLOGIC UNITS

This chapter presents a description of the water resources for each of the 11 hydrologic units in the San Diego Region. In addition, a description of each of the 54 subunits (see Plate 1) is presented in Table 10. Physiographic boundaries are discussed in Chapter II.

This chapter should be reviewed in conjunction with the plates, figures, and appendixes that form the basis for this report on the San Diego Region.

SAN JUAN HYDROLOGIC UNIT (Z-01.00)

San Juan Hydrologic Unit (Unit 1) is a trapezoidal-shaped area of about 500 square miles (Plate 1). A significant portion of this unit is taken up by the Camp Pendleton Marine Base, which contains a large military population. Laguna Beach, San Juan Capistrano, Capistrano Beach, and San Clemente are other major population centers. Several smaller towns are scattered along the coast. The major land use is military, with urban-suburban development and irrigated agriculture as secondary uses. Recently, however, urbanization has been accelerated with the building of extensive new housing tracts.

Many streams drain this unit, the largest being San Juan, San Mateo, San Onofre, and Aliso Creeks. In general, annual precipitation is slightly higher in this unit than in most of the southern units of the Region, ranging from less than 12 inches near the coast to 30 inches close to the eastern boundary (Plate 5). Information on the subunits of the San Juan Hydrologic Unit is presented in Table 10.

Unit 1 occurs in both the coastal plain and mountain-valley physiographic sections. The coastal plain section is 12 to 15 miles in width. It is composed of Upper Cretaceous and Mio-Pliocene marine sediments which have been incised and backfilled with Recent alluvium (Plates 2A and 3A). The alluvium, up to 200 feet in thickness (Plate 4A), is the major water-bearing sediment. The Capistrano and San Mateo Formations are locally water bearing, but the other pre-Quaternary sediments in this unit are essentially nonwater bearing.

The northeastern portion of the unit (mountain-valley section) is composed principally of crystalline rocks (tonalites, granodiorites, and metamorphic rocks) along with associated areas of residuum. The residuum and fractured crystalline rocks are the chief water-bearing materials in this part of the unit. Residuum overlying the fractured rocks attains thicknesses in some areas of 100 feet.

TABLE 10

DESCRIPTION OF HYDROLOGIC SUBUNITS

AREAL CODE AND NAME OF SUBUNIT[1]	AREAL DESCRIPTION	GEOHYDROLOGY							GROUND WATER QUALITY			
		Rock Type[2] By Physiographic Section		Annual Precipitation	Water Bearing Materials	Maximum Drilled Thickness	Depth To Water	Other Sources Of Ground Water[4]	Predominant Chemical Character	TDS	Rating (factors exceeding limits for suitable rating)[5]	
		Coastal Plain	Mountain-Valley	inches		feet	feet			ppm	Domestic Use	Irrigation Use
					Z-01.00 San Juan Hydrologic Unit							
Z-01.A0 Laguna	Triangular, 64 sq. miles; largely in Aliso Creek watershed	Qal, Qp_4, Qp_1, Tk_6, Tk_5		<13-19	Qal	100	<25-100	--	Na SO_4, Na HCO_3	250-5,000	Marginal-inferior (TDS, SO_4, F); locally suitable	Marginal-inferior (EC, Cl, locally B)
					Tk_6, Tk_5	1,100	--	--	Na SO_4, Na HCO_3	500-1,500	Suitable-marginal (TDS)	Marginal-inferior (B, % Na)
Z-01.B0 San Juan	Triangular, 177 sq. miles; Arroyo Trabuco and San Juan Creek watersheds	Qal, Qp_4, Qp_1, Tk_6, Tk_5, Tk_3, Tk_1	Qr, Kgr, Kto, Kbi, M_2	<13-30	Qal	200	<25-75	--	Ca-Na SO_4-HCO_3 Ca HCO_3	<250-5,000	Suitable-inferior (SO_4, TDS)	Suitable; locally marginal-inferior (EC, Cl, % Na)
					Qr, fractured crystal-line rocks	250	--	--	--	--	--	--
Z-01.C0 San Clemente	Triangular, 21 sq. miles; vicinity of San Clemente	Qal, Qp_1, Tk_6, Tk_5		<12-15	Tk_6	960	>100	Mainly connate water	Na-Ca HCO_3-Cl, Na Cl	250-750	Suitable; locally inferior (SO_4)	Suitable-inferior (EC, Cl)
Z-01.D0 San Mateo	Rectangular, 135 sq. miles; San Mateo Creek watershed	Qal, Qp_4, Qp_1, Tk_6, Tk_5, Tk_3, Tk_1	Qr, Tk, Kgr, Kgr_1, Kto_1, Kbi, M_2	<12-20	Qal	80	<25-50	--	Ca-Na HCO_3-Cl	250-750	Suitable	Suitable
Z-01.E0 San Onofre	Triangular, 103 sq. miles; San Onofre Creek watershed	Qal, Qp_4, Qp_1, Tk_6, Tk_5, Tk_3, Tk_1	Qr, Kto_3, Kto_1, Kbi, M_2	<13-19	Qal	--	<25-50	--	Variable[3]	250-1,000	Suitable	Suitable; locally marginal (Cl, % Na, EC)
					Tk_6, Tk_5	--	--	Mainly connate water	--	500-750	Suitable	Suitable

DESCRIPTION OF HYDROLOGIC SUBUNITS

(CONTINUED)

AREAL CODE AND NAME OF SUBUNIT[1]	AREAL DESCRIPTION	GEOHYDROLOGY: Rock Type[2] By Physiographic Section: Coastal Plain	Mountain-Valley	Annual Precipitation inches	Water Bearing Materials	Maximum Drilled Thickness feet	Depth To Water feet	Other Sources Of Ground Water[4]	GROUND WATER QUALITY: Predominant Chemical Character	TDS ppm	Rating (factors exceeding limits for suitable rating)[5]: Domestic Use	Irrigation Use
					Z-02.00 Santa Margarita Hydrologic Unit							
Z-02.A0 Ysidora	Rectangular, 43 sq. miles; extends north from Camp Del Mar to Fallbrook	Qal, Qp_4, Qp_1, Tk_5, Tk_3	Qal, Qr, Qp_4, Kgr_1, Kto_3, Kbi, M_2	<12-18	Qal	200	<25	Sea water, connate water[3] from Tk_3	Na Cl, Na HCO_3-Cl	500->5,000	Suitable-inferior (TDS, SO_4, NO_3)	Suitable-inferior (Cl, EC)
					Qr, fractured crystal-line rocks	350	--	--	Variable	500-1,500	Inferior (NO_3); locally suitable	Marginal-inferior (EC, Cl); locally suitable
Z-02.B0 De Luz	Trapezoidal, 112 sq. miles; portions of Santa Margarita River and De Luz Creek water-sheds		Qal, Qp_4, Qr, Tk, Kgr_1, Kto_3, Kbi, M_2	16-20	Qal, Qp_4	--	--	--	Ca-Na HCO_3, locally Na Cl	<250-500	Suitable; locally inferior (F)	Suitable; locally inferior (% Na)
					Qr, fractured crystal-line rocks	--	--	--	Variable	<250-1,500	Suitable; inferior (SO_4, NO_3, TDS)	Suitable; locally marginal (EC, Cl)
Z-02.C0 Murrieta	Horseshoe shaped, 133 sq. miles; portions of Murrieta and Warm Springs Creeks watersheds		Qal, Qp_2, Qp_4, Qr, Tk, Kgr_1, Kbi, M_2	13-20	Qal, Qp_2	1,350	<25->100	Deep seated water along faults[3]	Na-Ca HCO_3-Cl, Ca-Na HCO_3, Na Cl-HCO_3	<250-500, locally >500	Suitable; locally marginal-inferior (TDS, SO_4, NO_3)	Suitable; locally marginal-inferior (% Na, EC, Cl)
					Qr, fractured crystal-line rocks	100	<25-50	Deep seated water along faults[3]	Variable	250-1,000	Suitable	Suitable
Z-02.D0 Auld	Parallelogram, 96 sq. miles; Tucalota Creek watershed		Qal, Qp_2, Qr, Kgr_1, Kto, Kto_3, Kbi, M_3, M_2	13-18	Qal, Qp_2	600	<25-75, locally >100	Deep seated water[3]	Na-Ca HCO_3	<250-1,000	Suitable; locally marginal-inferior (F, SO_4)	Suitable; locally marginal-inferior (% Na, Cl, B)
					Qr, fractured crystal-line rocks	200	<25-50	--	Variable	750-1,500	Suitable-inferior (TDS, SO_4)	Suitable; locally marginal (B)

DESCRIPTION OF HYDROLOGIC SUBUNITS

(CONTINUED)

AREAL CODE AND NAME OF SUBUNIT[1]	AREAL DESCRIPTION	GEOHYDROLOGY: Rock Type[2] By Physiographic Section — Coastal Plain	Rock Type — Mountain-Valley	Annual Precipitation inches	Water Bearing Materials	Maximum Drilled Thickness feet	Depth To Water feet	Other Sources Of Ground Water[4]	GROUND WATER QUALITY: Predominant Chemical Character	TDS ppm	Rating (factors exceeding limits for suitable rating)[5] — Domestic Use	Rating — Irrigation Use
Z-02.EO **Pechanga**	Triangular, 44 sq. miles; Temecula River and Pechanga Creek watersheds		Qal, Qp_2, Kgr_1, Kbi, M_2	14-20	Qal, Qp_2	2,500	Flowing to 75	Deep seated water[3]	Na-Ca HCO_3-Cl	<250-1,000	Suitable; locally marginal-inferior (F, SO_4)	Suitable-inferior (% Na)
Z-02.FO Wilson	Rectangular, 60 sq. miles; Wilson Creek watershed		Qal, Qp_2, Qr, Kto, M_3	13-18	Qal, Qp_2	400	<25-100	Deep seated water along faults[3]	Na HCO_3, Ca-Na HCO_3, Na Cl-SO_4	250-1,500	Suitable; locally marginal (TDS, F, SO_4)	Suitable-marginal (% Na, Cl)
					Qr, fractured crystal-line rocks	400	<25-50	--	Na HCO_3, Ca SO_4	250-1,500	Suitable-marginal (TDS, SO_4)	Suitable
Z-02.GO Anza	Rectangular-elliptical, 85 sq. miles; includes Anza and Coahuila Valleys		Qal, Qp_4, Qp_3, Qr, Kto, M_3	13-19	Qal, Qp_4, Qp_3	400	<25-100	Deep seated water along faults[3]	Variations of Ca-Na HCO_3-SO_4	<250-750	Suitable; locally marginal-inferior (SO_4, NO_3)	Suitable; locally marginal (% Na)
					Qr, fractured crystal-line rocks	400	--	--	--	--	--	--
Z-02.HO Aguanga	Mushroom shaped, 102 sq. miles; includes **Radec** and Aguanga Valleys		Qal, Qp_2, Qr, Kbr, Kto, M_3, M_2, M_1	13-25	Qal, Qp_2	2,500	Flowing to 100	Deep seated water along faults[3]	Variable	250-1,500	Suitable-inferior (TDS, SO_4, F)	Suitable; locally marginal-inferior (% Na)
					Qr, fractured crystal-line rocks	200	<25	--	Na HCO_3, Ca HCO_3	250-1,500	Suitable; inferior (F)	Suitable-inferior (% Na)

DESCRIPTION OF HYDROLOGIC SUBUNITS

(CONTINUED)

AREAL CODE AND NAME OF SUBUNIT[1]	AREAL DESCRIPTION	GEOHYDROLOGY: Rock Type[2] By Physiographic Section: Coastal Plain	GEOHYDROLOGY: Rock Type[2] By Physiographic Section: Mountain-Valley	Annual Precipitation inches	Water Bearing Materials	Maximum Drilled Thickness feet	Depth To Water feet	Other Sources Of Ground Water[4]	GROUND WATER QUALITY: Predominant Chemical Character	TDS ppm	Rating (factors exceeding limits for suitable rating)[5]: Domestic Use	Rating (factors exceeding limits for suitable rating)[5]: Irrigation Use
Z-02.I0 Oakgrove	Rectangular, 75 sq. miles; includes Aguanga Mountain area		Qal, Qp_3, Qp_2, Qr, Kgr, Kto, M_3, M_2	13-20	Qal, Qp_2	200	<25-75	Deep seated water along faults[3]	Ca-Na HCO_3, Na HCO_3	250-500	Suitable; locally marginal (SO_4)	Suitable; locally inferior (% Na)
					Qr, fractured crystal-line rocks	300	75->100	--	Na HCO_3, Ca HCO_3	250-500	Suitable	Suitable
					Z-03.OC San Luis Rey Hydrologic Unit							
Z-03.A0 Bonsall	Triangular, 186 sq. miles; includes Oceanside, Valley Center, and portions of Fallbrook	Qal, Qp_4, Qp_1, Tk_5, Tk_3	Qal, Tk, Qr, Kgr, Kgr_1, Kto_3, Kbi, M_2	<12-20	Qal	210	<25->100	Sea water, connate water[3] from Tk_3	Na-Ca Cl, Ca-Na SO_4-Cl	500->5,000	Marginal-inferior (TDS, SO_4, NO_3); locally suitable	Suitable-inferior (Cl, EC, % Na)
					Qr, fractured crystal-line rocks	130	<25-50	--	Na-Ca HCO_3	250-1,500	Suitable; locally marginal-inferior (SO_4, NO_3)	Suitable; locally marginal (EC, Cl)
Z-03.B0 Monserate	Rectangular, 171 sq. miles; portions of San Luis Rey River watershed		Qal, Qp_3, Qr, Kgr, Kgr_1, Kto_3, Kbi, M_3, M_1	17-45	Qal, Qp_3	400	<25->100	Deep seated water along faults[3]	Ca-Na HCO_3, Ca SO_4 and variations	250-500, locally 500-1,000	Suitable; locally marginal-inferior (SO_4)	Suitable
					Qr, fractured crystal-line rocks	230	--	Deep seated water along faults[3]	Variable	250-500	Suitable; locally marginal-inferior (F, SO_4)	Suitable; locally marginal-inferior (% Na, B)

DESCRIPTION OF HYDROLOGIC SUBUNITS

(CONTINUED)

AREAL CODE AND NAME OF SUBUNIT[1]	AREAL DESCRIPTION	GEOHYDROLOGY: Rock Type[2] By Physiographic Section: Coastal Plain	Rock Type[2]: Mountain-Valley	Annual Precipitation inches	Water Bearing Materials	Maximum Drilled Thickness feet	Depth To Water feet	Other Sources Of Ground Water[4]	GROUND WATER QUALITY: Predominant Chemical Character	TDS ppm	Rating (factors exceeding limits for suitable rating)[5]: Domestic Use	Rating: Irrigation Use
Z-03.CO Warner	Rhombodial, 208 sq. miles; Lake Henshaw vicinity		Qal, Qp_2, Qr, Kto_3, Kto_2, Kbi, M_3	20-40	Qal, Qp_2	900	<25->100	Deep seated water along faults[3]	Na-Ca HCO_3, Ca-Na HCO_3	<250-500	Suitable; locally marginal-inferior (F)	Suitable-inferior (% Na)
					Qr, fractured crystal-line rocks	200	--	--	--	--	--	--
Z-04.00 Carlsbad Hydrologic Unit												
Z-04.AO Loma Alta	Needle shaped, 10 sq. miles; extends 8 miles inland from Oceanside	Qal, Qp_1, Tk_3		<12-13	Qal	--	<25-50	Connate water[3] from Tk_3	Na Cl	1,000-5,000	Suitable-inferior (TDS, SO_4)	Inferior (Cl)
					Tk_3	--	>100	Mainly connate water	Na Cl[3]	1,000-1,500[3]	Marginal[3] (TDS)	Inferior (Cl)
Z-04.BO Vista	Club shaped, 23 sq. miles; Carlsbad-Vista area	Qal, Qp_1, Tk_3, Kto_1, M_2	Qal, Qr, Tk_3, Kto_1, Kbi, M_2	<12-14	Qal	100	<25	--	Na Cl, Mg-Na Cl	750-1,500	Marginal (TDS); inferior (NO_3)	Marginal-inferior (Cl)
					Qr, fractured crystal-line rocks	300	--	--	Na Cl	750-1,500	Marginal (TDS)	Marginal (Cl)
Z-04.CO Agua Hedionda	Elongate, 30 sq. miles; includes Agua Hedionda Creek watershed	Qal, Qp_1, Tk_3	Qal, Qr, Tk_3, Kgr_1, Kto_1, Kbi, M_2	<12-15	Qal	100	<25	--	Na Cl, Na-Ca Cl	500-2,000	Marginal-inferior (TDS); locally suitable	Inferior (Cl)
					Tk_3	280	--	Mainly connate water	Na-Ca Cl, locally Na-Ca SO_4		Suitable; locally marginal-inferior (SO_4, TDS)	Inferior (Cl)
					Qr, fractured crystal-line rocks	--	--	--	--	--	--	--

DESCRIPTION OF HYDROLOGIC SUBUNITS

(CONTINUED)

AREAL CODE AND NAME OF SUBUNIT[1]	AREAL DESCRIPTION	GEOHYDROLOGY							GROUND WATER QUALITY			
		Rock Type[2] By Physiographic Section		Annual Precipitation	Water Bearing Materials	Maximum Drilled Thickness	Depth To Water	Other Sources Of Ground Water[4]	Predominant Chemical Character	TDS	Rating (factors exceeding limits for suitable rating)[5]	
		Coastal Plain	Mountain-Valley	inches		feet	feet			ppm	Domestic Use	Irrigation Use
Z-04.DO Encinas	Triangular, 4 sq. miles; extends 4 miles inland from ocean between Hedionda and Batiquitos Lagoons	Qal, Qp_1, Tk_3, Tk_1		<12-13	Qal	260	<25-75	Mainly connate water	Na Cl	500-1,500	Marginal-inferior (TDS, SO_4)	Inferior (Cl)
Z-04.EO San Marcos	Rectangular, 55 sq. miles; extends from Batiquitos Lagoon to San Marcos	Qal, Qp_1, Tk_3	Qal, Qr, Kgr, Kgr_1, Kto_1, Kbi, M_2	<12-17	Qal	<100	<25	--	Na Cl, Na HCO_3, Na SO_4	500-5,000	Suitable-inferior (NO_3, TDS, SO_4)	Marginal-inferior (EC, Cl)
					Tk_3	1,400	--	Mainly connate water	Na Cl	750-1,500	Marginal (TDS, locally SO_4)	Marginal-inferior (EC, Cl)
					Qr, fractured crystal-line rocks	--	60	--	Mg-Ca Cl, Mg-Na Cl	500->1,000	Suitable-inferior (TDS, SO_4)	Marginal; locally inferior (EC, Cl)
Z-04.FO Escondido	Triangular, 89 sq. miles; Escondido Creek watershed	Qal, Qp_4, Qp_1, Tk_3	Qal, Qp_4, Qr, Kgr, Kgr_1, Kto_1, Kbi, M_2	<11-20	Qal	100	<25-50	Connate water[3]	Na Cl, locally Na Cl-SO_4	500-5,000	Marginal-inferior (TDS, SO_4)	Inferior (EC, Cl, % Na)
					Tk_3	1,000[3]	25-50[3]	Connate water[3]	Na Cl[3]	1,000-5,000[3]	Marginal[3] (TDS, SO_4, NO_3)	Inferior[3] (EC, Cl)
					Qr, fractured crystal-line rocks	450	<25-75	--	Na Cl-HCO_3, Mg Cl	250->5,000	Suitable-inferior (TDS, NO_3, SO_4)	Marginal-inferior (Cl, EC); locally suitable

DESCRIPTION OF HYDROLOGIC SUBUNITS

(CONTINUED)

AREAL CODE AND NAME OF SUBUNIT[1]	AREAL DESCRIPTION	GEOHYDROLOGY: Rock Type[2] By Physiographic Section: Coastal Plain	GEOHYDROLOGY: Rock Type[2] By Physiographic Section: Mountain-Valley	Annual Precipitation inches	Water Bearing Materials	Maximum Drilled Thickness feet	Depth To Water feet	Other Sources Of Ground Water[4]	GROUND WATER QUALITY: Predominant Chemical Character	TDS ppm	Rating (factors exceeding limits for suitable rating)[5]: Domestic Use	Rating (factors exceeding limits for suitable rating)[5]: Irrigation Use
					Z-05.00 San Dieguito Hydrologic Unit							
Z-05.A0 San Dieguito	Rectangular, 45 sq. miles; from coast to Lake Hodgea	Qal, Qp_4, Qp_1, Tk_3	Tk_4, Kbi, M_2	<11-15	Qal	150	<25-100	Sea water, connate water3	Na Cl, Na-Ca Cl	500->5,000	Marginal-inferior (TDS, SO_4); locally suitable	Inferior; locally marginal (EC, Cl)
					Tk_3	850	>100	Mainly connate water	Na Cl, Na Ca-Cl	500->5,000	Marginal-inferior (TDS, SO_4, F); locally suitable	Inferior (EC, Cl); locally suitable
					Fractured crystal-line rocks	--	--	--	Na Cl, Na-Ca SO_4[3]	1,000-5,000[3]	Marginal-inferior[3] (TDS, SO_4, F)	Inferior[3] (EC, Cl)
Z-05.B0 Hodges	Rectangular, 50 sq. miles; Lake Hodges and portions of Escondido	Qal, Qr, Tk_4, Kgr, Kto_1, Kbi, M_2	Qal, Qr, Tk_4, Kgr_1, Kto_1, Kbi, M_2	15-18	Qal	65	25-75	--	Na-Ca Cl-HCO_3	500-1,000	Suitable	Marginal (Cl)
					Qr, fractured crystal-line rocks	450	<25->100	--	Variable	250-1,000	Inferior (NO_3); locally suitable	Suitable; locally marginal (EC, Cl)
Z-05.C0 San Pasqual	Trapezoidal, 66 sq. miles; includes San Pasqual Valley		Qal, Qp_4, Qr, Kgr, Kgr_1, Kto_3, Kto_1, Kbi, M_3, M_1	15-25	Qal	210	<25-75	--	Na-Ca Cl-HCO_3, and variations	250-1,000 locally 1,000-1,500	Suitable; locally marginal-inferior (NO_3, F, TDS)	Suitable; locally marginal-inferior (Cl)
					Qr, fractured crystal-line rocks	100	--	--	--	250-500 [3]	--	--
Z-05.D0 Santa Maria	Somewhat rectangular, 57 sq. miles; Santa Maria Creek watershed		Qal, Qp_4, Qr, Kgr, Kgr_1, Kto_2, Kto_1, Kbi, M_1	17-25	Qr, fractured crystal-line rocks locally Qal, Qp_4	950	<25-75	--	Na Cl, Na HCO_3, Na-Mg HCO_3	<250-1,000	Suitable; locally marginal-inferior (NO_3, TDS)	Suitable; locally marginal (EC, Cl)

DESCRIPTION OF HYDROLOGIC SUBUNITS

(CONTINUED)

AREAL CODE AND NAME OF SUBUNIT[1]	AREAL DESCRIPTION	GEOHYDROLOGY: Rock Type[2] By Physiographic Section							GROUND WATER QUALITY			
		Coastal Plain	Mountain-Valley	Annual Precipitation inches	Water Bearing Materials	Maximum Drilled Thickness feet	Depth To Water feet	Other Sources Of Ground Water[4]	Predominant Chemical Character	TDS ppm	Rating (factors exceeding limits for suitable rating)[5]: Domestic Use	Irrigation Use
Z-05.E0 Santa Ysabel	Triangular, 129 sq. miles; Santa Ysabel Creek watershed including Sutherland Reservoir		Qal, Qp_3, Qr, Kto_3, Kto_2, Kto_1, Kbi, M_3 M_1	15-30	Qal	50	<25	--	Ca HCO_3	250-500	Suitable; locally inferior (NO_3)	Suitable
					Qr, fractured crystal-line rocks	150	--	--	Na HCO_3	<250-500	Suitable	Suitable
					Z-06.00 Penasquitos Hydrologic Unit							
Z-06.A0 Soledad	Rectangular, 55 sq. miles	Qal, Qp_1, Tk_4, Tk_3	Kto_1, Kbi, M_2	<8-14	Qal	--	<25-50	Connate water[3] from Tk_3	Na Cl, Na-Ca Cl	500->5,000	Suitable-inferior (TDS, SO_4)	Marginal-inferior (EC, Cl)
					Tk_3 locally Tk_4	700	75->100	Mainly connate water	Na with varia-tions of SO_4, Cl, HCO_3	250-5,000	Suitable-marginal (TDS, SO_4)	Suitable-inferior (EC, Cl)
Z-06.B0 Poway	Somewhat elliptical, 41 sq. miles; Poway Valley	Qal, Qp_4, Qr, Tk_4	Qal, Qp_4, Qr, Tk_4 KGr_1, Kto_1, M_3, M_2	14-18	Qal, Qp_4	60	<25	--	Na Cl, some Ca Cl	500-1,500	Suitable-marginal (TDS, SO_4)	Suitable-inferior (Cl)
					Qr, fractured crystal-line rocks	--	--	--	--	--	--	--
Z-06.C0 Scripps	Long, narrow area, 24 sq. miles; La Jolla coastal area	Qal, Qp_1, Tk_4, Tk_3, Tk_1		<8-11	--	--	--	--	--	--	--	--
Z-06.D0 Miramar	"L" shaped, 41 sq. miles; includes Camp Mathews and Miramar Naval Air Station	Qal, Qp_1, Tk_4, Tk_3		8-14	Qal	50	--	Connate water[3]	Na-Ca Cl-SO_4[3]	500-1,500[3]	Inferior-marginal[3] (SO_4, TDS)	Inferior[3] (EC, Cl)
					Tk_3, Tk_4	350	>100	Mainly connate water	Na Cl-HCO_3	500-1,500	Marginal-inferior (TDS, SO_4, F)	Marginal-inferior (EC, Cl, % Na)

DESCRIPTION OF HYDROLOGIC SUBUNITS

(CONTINUED)

AREAL CODE AND NAME OF SUBUNIT[1]	AREAL DESCRIPTION	GEOHYDROLOGY							GROUND WATER QUALITY			
		Rock Type[2] By Physiographic Section		Annual Precipitation	Water Bearing Materials	Maximum Drilled Thickness	Depth To Water	Other Sources Of Ground Water[4]	Predominant Chemical Character	TDS	Rating (factors exceeding limits for suitable rating)[5]	
		Coastal Plain	Mountain-Valley	inches		feet	feet			ppm	Domestic Use	Irrigation Use
Z-06.EO Tecolote	Rectangular, 9 sq. miles	Qal, Qp_1, Tk_3		11-12	Tk_4, Tk_3, locally Qal	>100[3]	>100	Mainly connate water	Na Cl[3]	500-1,500	Marginal (TDS); locally suitable	Marginal (% Na, Cl)
					Z-07.00 San Diego Hydrologic Unit							
Z-07.AO Lower San Diego	Somewhat rhomboidal, 170 sq. miles; includes El Cajon, Lakeside, and portions of Camp Elliot	Qal, Qp_4, Qp_1, Qr, Tk_4, Kgr, Kto, M_2	Qal, Qp_4, Qr, Tk_4, Kgr_1, Kto_3, Kto_1, Kbi, M_3, M_2	<11-18	Qal, Qp_4	200	<25-75	Connate water, deep seated water[3]	Na-Ca Cl	250->5,000	Marginal-inferior (SO_4, TDS, NO_3)	Suitable-inferior (EC, Cl, Na)
					Tk_4	<300	--	Mainly connate water	Na Cl	>1,000-1,500	Marginal-inferior (TDS, SO_4)	Inferior (Cl, % Na)
					Qr, fractured crystal-line rocks	500	<25->100	Deep seated water, connate water[3]	Na-Ca Cl	<250->5,000	Suitable-inferior (NO_3, TDS)	Marginal-inferior (Cl); locally suitable
Z-07.BO San Vicente	Rectangular-triangular 75 sq. miles; San Vicente Reservoir area		Qal, Qp_4, Qr, Tk_4, Kgr_1, Kto_3, Kto_1, Kbi, M_3, M_2	16-20	Qal, Qp_4	>100[3]	<25-50	--	Variable	250-500	Suitable	Suitable
					Qr, fractured crystal-line rocks	>100[3]	50-100	--	Variable	250-500	Suitable; locally inferior (NO_3)	Suitable
Z-07.CO El Capitan	Rectangular, 88 sq. miles; includes Alpine, and El Capitan Reservoir		Qal, Qr, Kgr, Kgr_1, Kto_3, Kto_1, Kbi, M_3, M_1	16-35	Qr, fractured crystal-line rocks	200	<25->100	--	Variable	500-1,000	Suitable	Suitable; locally marginal (Cl)

DESCRIPTION OF HYDROLOGIC SUBUNITS

(CONTINUED)

AREAL CODE AND NAME OF SUBUNIT[1]	AREAL DESCRIPTION	GEOHYDROLOGY: Rock Type[2] By Physiographic Section: Coastal Plain	Mountain-Valley	Annual Precipitation (inches)	Water Bearing Materials	Maximum Drilled Thickness (feet)	Depth To Water (feet)	Other Sources Of Ground Water[4]	GROUND WATER QUALITY: Predominant Chemical Character	TDS (ppm)	Rating (factors exceeding limits for suitable rating)[5]: Domestic Use	Irrigation Use
Z-07.DO Cuyamaca	Almost circular, 105 sq. miles; includes Cuyamaca Reservoir and Julian		Qal, Qr, Kgr, Kto, Kbi, M_3, M_1	18-35	Qr, fractured crystalline rocks, Qal	350	50->100	--	Ca-Mg HCO_3	<250-750	Suitable; locally inferior (NO_3)	Suitable
				Z-08.00 Coronado Hydrologic Unit								
Z-08.AO Point Loma	Triangular, 6 sq. miles; Point Loma Peninsula	Qal, Qp_1, Tk_1		<11	--	--	--	--	--	--	--	--
Z-08.BO San Diego Mesa	Rectangular, 42 sq. miles; City of San Diego and San Diego Bay area	Qal, Qp_1, Tk_7, Tk_4	M_2	<11-13	Tk_4, Tk_7	350	>100	Mainly connate water	Na HCO_3, locally Na Cl	250-750	Suitable	Suitable
Z-08.CO Paradise	Triangular, 11 sq. miles; National City area	Qal, Qp_1, Tk_7, Tk_4		<11	Tk_4, Tk_7	800	>100	Mainly connate water	Na Cl, Na HCO_3[3]	500-750	Suitable	Suitable-marginal (Cl)
				Z-09.00 Sweetwater Hydrologic Unit								
Z-09.AO Lower Sweetwater	Mushroom shaped, 49 sq. miles; coastal Sweetwater River watershed	Qal, Qp_4, Qp_1, Tk_7, Tk	Qp_1, Qr, Tk_7, Tk, Kto_1, M_2	<11-14	Qal	70	<25	Connate water[3]	Na-Ca Cl	2,000-5,000	Inferior (TDS)	Inferior (EC, Cl)
					Qp_1, Tk_7	1,000	--	Connate water	Na SO_4[3]	750-1,000	Marginal (SO_4)	Suitable
Z-09.BO Middle Sweetwater	Triangular, 85 sq. miles; includes Sweetwater Reservoir		Qal, Qp_4, Qr, Tk_7, Tk, Kgr_1, Kgr, Kto_3, Kto_1, Kbi, M_3, M_2	12-19	Qal	50	<25-50	--	Na-Ca Cl-HCO_3, Na HCO_3, variable	250-1,000	Suitable	Suitable; locally marginal (Cl)
					Qr, fractured crystalline rocks	100	100	--	Variable	250-1,500	Suitable; locally marginal-inferior (NO_3, TDS)	Marginal-inferior (Cl, B); locally suitable

DESCRIPTION OF HYDROLOGIC SUBUNITS

(CONTINUED)

AREAL CODE AND NAME OF SUBUNIT[1]	AREAL DESCRIPTION	GEOHYDROLOGY: Rock Type[2] By Physiographic Section: Coastal Plain	GEOHYDROLOGY: Rock Type[2] By Physiographic Section: Mountain-Valley	GEOHYDROLOGY: Annual Precipitation inches	GEOHYDROLOGY: Water Bearing Materials	GEOHYDROLOGY: Maximum Drilled Thickness feet	GEOHYDROLOGY: Depth To Water feet	GEOHYDROLOGY: Other Sources Of Ground Water[4]	GROUND WATER QUALITY: Predominant Chemical Character	GROUND WATER QUALITY: TDS ppm	GROUND WATER QUALITY: Rating (factors exceeding limits for suitable rating)[5]: Domestic Use	GROUND WATER QUALITY: Rating (factors exceeding limits for suitable rating)[5]: Irrigation Use
Z-09.C0 Upper Sweetwater	Elongate, 100 sq. miles; Sweetwater River watershed including Lake Loveland and Descanso		Qal, Qp_4, Qr, Kgr_1, Kgr, Kto_3, Kto_1, Kbi, M_3, M_2, M_1	17-35	Qal	50	<25-50	--	Ca HCO_3, Ca-Na HCO_3	<250-500	Suitable	Suitable
					Qr, fractured crystal-line rocks	300	<25-50	--	Variable	<250-500	Suitable	Suitable
Z-10.00 Otay Hydrologic Unit												
Z-10.A0 Coronado	Arcuate Peninsula, 9 sq. miles; borders San Diego Bay	Qal, Qp_1		<11	--	--	--	--	--	--	--	--
Z-10.B0 Otay	Triangular, 47 sq. miles; extends from Imperial Beach to Lower Otay Reservoir	Qal, Qp_1, Tk_7, Tk, M_2	Tk, Tk_7, M_2	<11-17	Qal	170	25-50	Connate water[3]	Na Cl	1,000-2,000	Marginal (TDS)	Marginal-inferior (Cl)
					Tk_7	1,200	<25->100	Mainly connate water	Na Cl	500-5,000	Suitable-inferior (TDS, NO_3, SO_4)	Marginal-inferior (Cl, % Na, EC)
Z-10.C0 Dulzura	Nearly circular, 100 sq. miles; includes Lower Otay Reservoir and a portion of Jamul		Qal, Qp_4, Qp_1, Qr, Tk_7, Tk, Kgr_1, Kto_1, Kbi, M_2	12-19	Qal, Qr, fractured crystal-line rocks	150	<25-75	--	Na Cl, Na-Ca HCO_3, variable	250-1,500	Suitable; locally marginal-inferior (TDS, NO_3)	Suitable-inferior (Cl)
Z-11.00 Tia Juana Hydrologic Unit												
Z-11.A0 Tia Juana	Rectangular, 30 sq. miles; Tia Juana River area	Qal, Qp_1, Tk_7, Tk	M_2	<11-15	Qal	150	<25-75	Sea water intrusion, connate water[3]	Na Cl	1,000->5,000	Inferior (TDS); locally marginal (SO_4)	Inferior (EC, Cl, % Na); locally marginal (EC)
					Tk_7	1,300	75->100	Connate water	Na Cl	1,000-1,500	Marginal-inferior (TDS, F)	Inferior (% Na, Cl)

DESCRIPTION OF HYDROLOGIC SUBUNITS
(CONTINUED)

AREAL CODE AND NAME OF SUBUNIT[1]	AREAL DESCRIPTION	GEOHYDROLOGY: Rock Type[2] By Physiographic Section		GEOHYDROLOGY: Annual Precipitation	GEOHYDROLOGY: Water Bearing Materials	GEOHYDROLOGY: Maximum Drilled Thickness	GEOHYDROLOGY: Depth To Water	GEOHYDROLOGY: Other Sources Of Ground Water[4]	GROUND WATER QUALITY: Predominant Chemical Character	GROUND WATER QUALITY: TDS	GROUND WATER QUALITY: Rating (factors exceeding limits for suitable rating)[5]	
		Coastal Plain	Mountain-Valley	inches		feet	feet			ppm	Domestic Use	Irrigation Use
Z-11.BO Potrero	Ellipitical, 81 sq. miles; Cottonwood Creek watershed		Qal, Qp$_4$, Qr, Kgr$_1$, Kto$_3$, Kbi, M$_2$	16-20	Qal, Qr, fractured crystal-line rocks	170	<25-50	--	Variations of Na, Ca, HCO$_3$, Cl	250-750	Suitable	Suitable; locally marginal (Cl)
Z-11.CO Barrett Lake	Triangular, 97 sq. miles; lower drainage of Pine Valley Creek and Barrett Lake		Qal, Qr, Kgr$_1$, Kto$_3$, Kto$_1$, Kbi, M$_1$	19-25	Qal, Qr, fractured crystal-line rocks	800	--	--	Variable[3]	250-750[3]	Suitable	Suitable
Z-11.DO Monument	Crescent shaped, 37 sq. miles; upper drainage of Pine Valley Creek including Pine Valley		Qal, Qr, Kgr$_1$, Kto$_3$, Kto$_1$, Kbi, M$_3$, M$_1$	25	Qal, Qr, fractured crystal-line rocks	900	<25-50	--	Ca HCO$_3$	<250-500	Suitable	Suitable; locally marginal (Cl)
Z-11.EO Morena	Crescent shaped, 24 sq. miles; Morena Reservoir area		Qal, Qr, Kgr$_1$, Kto$_3$, Kbi, M$_1$	20-25	Qal, Qr, fractured crystal-line rocks	300	--	--	Ca HCO$_3$[3]	<250[3]	Suitable[3]	Suitable[3]
Z-11.FO Cottonwood	Elongate triangular, 45 sq. miles; headwaters of Cottonwood Creek		Qal, Qr, Kgr$_1$, Kto$_3$, Kto$_2$, Kto$_1$, Kbi, M$_2$, M$_1$	20-25	Qal, Qr, fractured crystal-line rocks	--	<25	--	Ca HCO$_3$[3]	<250-750	Suitable	Suitable
Z-11.GO Cameron	Crescent shaped, 45 sq. miles; La Posta Creek watershed		Qal, Qr, Kgr$_1$, Kto$_2$, Kto$_1$, M$_3$, M$_1$	19-20	Qal, Qr, fractured crystal-line rocks	--	<25-50	--	Ca-Na HCO$_3$[3]	<250-500	Suitable	Suitable
Z-11.HO	Triangular, 107 sq. miles; Campo Creek watershed		Qal, Qr, Kgr$_1$, Kto$_3$, Kto$_2$, Kbi	17-20	Qal, Qr, fractured crystal-line rocks	--	25-75	--	Na-Ca HCO$_3$, Ca-Na HCO$_3$, variations	<250-500	Suitable	Suitable; locally inferior (%Na)

1. See Plate 1.
2. For explanation of rock type, see Plate 2, and for boundaries of physiographic sections, see Illustration on page 14.
3. Based on limited and/or questionable data.
4. Sources other than precipitation and runoff.
5. See Table 8.

Ground water in hydrologic Unit 1 is obtained from more than 150 wells drilled mainly in the alluvium (Plate 6A). Depth to water in these wells is generally less than 50 feet (Plate 8A).

The chemical character of water produced from the alluvium in the San Juan Creek drainage system (San Juan and Arroyo Trabuco Creeks) is generally calcium sulfate toward the coast and calcium bicarbonate inland (Plate 11A). The sulfate is probably derived from gypsiferous deposits occurring within the Miocene marine sediments in the adjacent highlands. Runoff picks up the sulfate (Plate 10) from these sediments and carries it into the Quaternary alluvium.

In general, the concentration of the total dissolved solids of ground water produced from alluvium in the San Juan Creek drainage system ranges from about 250 to more than 2,000 ppm (Plate 9A) with concentrations increasing progressively downstream. These increases can probably be attributed in part to increased utilization. Water produced from the alluvium in San Mateo and San Onofre Creeks is of a calcium-sodium bicarbonate-chloride character. Here, the total dissolved solids content ranges from 250 to 750 ppm.

Around Las Flores Mission, the water appears to be strongly influenced by magnesium. The presence of magnesium can

San Juan Creek Drainage System
in Unit 1, January 1966

Recently, urbanization has been accelerated with the building of extensive new housing tracts.

probably be attributed to the glaucophane schists associated with the San Onofre Breccia.

Ground water around San Mateo, San Onofre, and Las Flores Mission is generally rated suitable for domestic uses. It is also generally rated suitable for irrigation, except at Las Flores Mission where it is marginal. This is because of its high chloride ion concentrations.

The rating of ground water for domestic uses (Plate 12A) in the vicinity of San Juan Creek and Arroyo Trabuco Creek is mainly marginal to inferior with water of suitable rating being present inland. High sulfate ion concentrations are responsible for these marginal and inferior ratings. In this same area, the ground water is rated as suitable to marginal (Plate 13A) for irrigation, with that in occasional localized areas rated as inferior. The marginal and inferior ratings are due to high electrical conductivity and high chloride concentrations.

SANTA MARGARITA HYDROLOGIC UNIT (Z-02.00)

Santa Margarita Hydrologic Unit (Unit 2) is a rectangular-shaped area of about 750 square miles (Plate 1). Included in it are portions of Camp Pendleton as well as the civilian population centers of Murrieta, Temecula, and part of Fallbrook. The unit is considered to be largely unpopulated in that the population centers are small in size as compared to the areal extent of the unit.

This hydrologic unit is drained largely by the Santa Margarita River, Murrieta Creek, and Temecula River. The major surface water storage areas are Vail Lake and O'Neill Lake. Annual precipitation ranges from less than 12 inches near the coast to more than 25 inches inland near Palomar Mountain (Plate 5). Additional information concerning individual hydrologic sub-units is shown on Table 10.

The Santa Margarita Hydrologic Unit lies predominately in the mountain-valley physiographic section. A small strip of the coastal plain physiographic section occurs mainly in the Camp Pendleton area. This coastal strip is composed of Eocene sediments (La Jolla Formation), which are cut by alluvium-filled valleys. The alluvium, which varies from 150 to 200 feet in thickness (Plate 4A) is the principal water-bearing formation in this portion of the unit.

East of Camp Pendleton, the rocks vary from tonalites, granodiorites, gabbros, and metamorphic rocks to residuum, alluvium, and Pleistocene nonmarine sediments (Temecula Arkose), as shown on Plates 2A and 3A. Principal water-bearing materials are

Northwest from Radec Toward
Vail Lake in Unit 2, January 1966

The unit lies predominately in the
mountain-valley physiographic section.

alluvium, Temecula Arkose, and residuum. The residuum, however, has been largely dewatered, and fractured crystalline rocks are now being utilized for water production in many areas. On the other hand, the thick Pleistocene nonmarine sediments (some water wells have been drilled more than 2,000 feet deep) represent a potentially large supply of ground water.

This discussion is based on information obtained from more than 100 wells (Plate 6A) in Unit 2. Depths to water vary widely, but most are less than 75 feet (Plate 8A).

As shown on Plate 11A, the chemical character of ground water near the coast is predominately sodium chloride, and that of water inland is sodium bicarbonate (Temecula-Murrieta area) and calcium bicarbonate (Anza Valley). The total dissolved solids content (Plate 9A) ranges from more than 5,000 ppm near the coast to about 250 ppm in the Temecula-Murrieta area. There are, however, local areas of high TDS content (750 ppm) near Murrieta and Temecula which probably reflect the influence of water from hot springs. Locally, water rises and issues forth along the northwesterly trending fault zones which traverse the unit. The deep-seated origin of this water is indicated by its high temperature, sodium chloride character, high percent sodium, high chloride, and relatively high fluoride content. These springs contribute chloride both to the ground water (Plate 11A) and to the surface water (Plate 10).

Sea-water intrusion along the coast is indicated by the sodium chloride character of the extracted ground water and a TDS content of more than 5,000 ppm. The predominant chloride ion in the ground water around Fallbrook and the high nitrate and sulfate content can probably be attributed in part to local domestic waste disposal and irrigation practices.

Ground water in the coastal plain section of Unit 2 is generally rated as inferior for domestic uses (Plate 12A) because of a high total dissolved solids content, and that around Fallbrook is inferior because of high nitrate and sulfate content. However, a large portion of Unit 2 contains ground water that is suitable for domestic uses.

Irrigation use ratings (Plate 13A) indicate that the ground water is generally suitable for agriculture although locally it is rated marginal to inferior. Along the coast the ground water is rated as marginal to inferior due to the high chloride content. East of the Temecula-Murrieta area and the Radec area the ground water is locally rated marginal to inferior because of high chloride content and high percent sodium.

SAN LUIS REY HYDROLOGIC UNIT (Z-03.00)

San Luis Rey Hydrologic Unit (Unit 3) is a rectangular-shaped area of about 565 square miles. It includes the population centers of Oceanside, San Luis Rey, and Valley Center as well as portions of Fallbrook and Camp Pendleton. In addition, there are several Indian reservations in the unit. The major stream system, the San Luis Rey River, is interrupted by Lake Henshaw, one of the largest water storage areas in the San Diego Region. However, due to the regional lack of rainfall, Lake Henshaw was only 4.5 percent full in May 1965 (Table 3).

Land in this unit is used mainly for irrigated agriculture, with urban uses increasing seaward. Annual precipitation is heavier than in the other units, ranging from less than 12 inches near the ocean to 45 inches near Palomar Mountain (Plate 5). Table 10 describes the subunits in Unit 3.

Unit 3 occurs almost entirely in the mountain-valley physiographic section with a small strip along the ocean in the coastal plain physiographic section. The coastal plain section is composed of Eocene marine sediments (La Jolla Formation), which are cut by alluvium-filled valleys (Plate 2A). The alluvium reaches a maximum thickness of about 200 feet toward the coast (Plates 3A and 4A), where it is the major water-bearing rock type although some ground water is also extracted from the Eocene sediments.

The mountain-valley section is composed of tonalites, gabbros, granodiorites, and metamorphic rocks, with large valley areas filled with alluvium and Pleistocene nonmarine sediments. The principal water-bearing units are the Pleistocene nonmarine sediments (Pala Fanglomerate and Temecula Arkose), which reach a thickness of 400 feet in the Pauma area (Plate 4A) and 900 feet in the Warner Ranch area. Ground water is also extracted from fractured crystalline rocks and residuum.

The production of ground water in Unit 3 is obtained from more than 250 wells, drilled mainly in the alluvium and Pleistocene nonmarine sediments along the San Luis Rey River Valley. Depths to water from the ground surface (Plate 8A) are variable, but generally they occur within a range of depths less than 25 feet to more than 100 feet. In the coastal section, wells penetrate the alluvium to a maximum depth of about 200 feet. In the Pauma area, wells have been drilled as much as 400 feet deep into the Pala Fanglomerate, and in the Lake Henshaw area, wells more than 900 feet deep have been drilled into the Temecula Arkose (Plate 3A).

The character of the water in the coastal plain section is generally sodium-calcium chloride (Plate 11A) with a total dissolved solids content that ranges from 500 to more than 5,000 ppm (Plate 9A). This reflects sea-water intrusion or connate water invasion.

Further inland, the water becomes calcium sulfate in character. The sulfate ion can probably be attributed in part to the weathering of pyrite and associated minerals within the crystalline rocks, discharge of hot springs, use of chemical fertilizers, and importation of Colorado River water.

In the Pala-Pauma area, the ground water is calcium bicarbonate in character, and in the Valley Center area, it is sodium bicarbonate. Around Lake Henshaw, the ground water character is also calcium to sodium bicarbonate with some sulfate and chloride present due to the influence of Warner Hot Springs and associated springs along fault zones. Lake Henshaw contains runoff of a sodium-calcium bicarbonate character which has a relatively low total dissolved solids content (Plate 10).

The chemical quality of water in the lake is indicative of the surrounding crystalline rocks (Plate 2A) in the watershed.

The ratings of ground water for domestic use (Plate 12A) in the coastal plain section are largely marginal to inferior because of a high total dissolved solids content; however, there are local areas rated as suitable. Farther inland, ratings of ground water for domestic purposes are essentially marginal to inferior because of high sulfate content. Ground water in the Pala-Pauma area is generally rated as suitable. Ground water in the vicinity of Lake Henshaw is rated as suitable for domestic use, but that around Warner Hot Springs is rated as inferior because of the high fluoride content.

Ratings of ground water for irrigation use (Plate 13A) are generally marginal to inferior in the coastal plain section and in the Bonsall area because of the high electrical conductivity and high chloride content. In the rest of the hydrologic unit, ratings of ground water for irrigation

Elsinore Fault Zone Traversing
Unit 3, January 1966

The San Luis Rey River is interrupted by Lake Henshaw, one of the largest water storage areas in the Region.

purposes are essentially suitable, except around the hot springs where high percent sodium leads to inferior ratings.

CARLSBAD HYDROLOGIC UNIT (Z-04.00)

Carlsbad Hydrologic Unit (Unit 4) is a somewhat triangular-shaped area of about 210 square miles, extending from Lake Wohlford on the east to the Pacific Ocean on the west, and from Vista on the north to Cardiff-by-the-Sea on the south. The unit includes within its boundaries the towns of Oceanside, Carlsbad, Leucadia, Encinitas, Cardiff-by-the-Sea, Vista, and Escondido. In the developed area, land use is nearly equally divided between irrigated agriculture and urban-residential.

The area is drained by Buena Vista, Agua Hedionda, San Marcos, and Escondido Creeks. Annual precipitation varies from less than 11 inches near Cardiff-by-the-Sea to 20 inches near Lake Wohlford as shown on Plate 5. The major storage area for this unit is Lake Wohlford. Table 10 presents information concerning the subunits within Unit 4.

Unit 4 occurs both in the coastal plain and mountain-valley physiographic sections. The coastal plain section consists of a strip about 10 miles wide. The topography is relatively flat and averages about 500 feet in elevation. Pleistocene and Eocene marine sediments (La Jolla Formation) are the dominant rock types in this area (Plate 2B). The valleys incised in these sediments have been subsequently backfilled with Recent alluvium. Alluvium and the La Jolla Formation are the major water-bearing sediments in the coastal plain section. Here, the alluvium probably attains a maximum thickness of more than 100 feet.

East of the coastal plain section elevations range from 500 to 2,500 feet. This portion of the unit is composed largely of crystalline rocks, including metamorphic rocks on the west and tonalites and granodiorites on the east. The major water-bearing formations in this portion of the unit are fractured crystalline rocks and residuum.

Production of ground water is from more than 100 wells (Plate 6B) located largely in the Escondido area. Depths to water in this unit are generally 50 feet or less (Plate 8B). Water production in the coastal area is mainly from alluvium and the La Jolla Formation. In the vicinity of Escondido, production is largely from the residuum and fractured crystalline rocks. The wells drilled in the Escondido area are generally less than 150 feet deep, although some wells have been drilled to depths of more than 200 feet (Plate 3B).

Batiquitos Lagoon Formed at the Mouth of San Marcos Creek in Unit 4, January 1962

California Division of Highways

Land use is nearly equally divided between irrigated agriculture and urban-residential.

The ground water that occurs in the coastal plain section of Unit 4 is generally sodium chloride in character (Plate 11B) and has a concentration of total dissolved solids that ranges from 500 to 5,000 ppm (Plate 9B).

This chemical character is probably the result of brackish waters that occurs in the lagoons. However, it may be the result of sea water and connate water migrating into the alluvium-filled valley areas because of overextractions of the ground water reservoirs.

In the Escondido area, the chemical character of the ground water is generally sodium chloride with subordinate magnesium, calcium, bicarbonate, and nitrate ions. The total dissolved solids content, like the chemical character, is variable and ranges from about 250 to more than 5,000 ppm. The sodium chloride character of the ground water can be largely attributed to local domestic waste disposal practices. In addition, the sodium chloride-sulfate character of surface flow in Escondido Creek (Plate 10) is a result of effluent releases from the waste water treatment plant at Escondido.

Subordinate ions of magnesium and calcium in the ground water near Escondido are related to the geologic environment. Magnesium ions, for example, can be roughly correlated with the gabbroic rocks (Plate 2B) in the Escondido-San Marcos area. The relatively high nitrate concentrations in the Escondido area are attributed largely to local domestic waste disposal practices and in part to the application of chemical fertilizers.

Ratings of ground water for domestic use (Plate 12B) in the coastal plain section range from suitable to inferior. The marginal and inferior ratings are due to a high total dissolved solids content along with high nitrates or high sulfates in local areas. Inland, around Escondido, ground water is generally rated as suitable or inferior for domestic purposes with the inferior ratings usually being due to a high nitrate content.

Ratings of ground water for irrigation use (Plate 13B) for this unit are generally marginal to inferior because of a high electrical conductivity and high chloride. Locally, however, there are areas where the ground water is rated suitable.

SAN DIEGUITO HYDROLOGIC UNIT (Z-05.00)

San Dieguito Hydrologic Unit (Unit 5) is a somewhat rectangular-to elliptical-shaped area of about 350 square miles. The unit includes the San Dieguito River and its tributaries, along with Santa Ysabel and Santa Maria Creeks. It contains the population centers of Ramona, Santa Ysabel, San Pasqual, Escondido, Solana Beach, and Del Mar. The developed area is used primarily for irrigated agriculture with minor urban uses. The unit contains two major reservoirs -- Lake Hodges and Sutherland -- which were 5.0 and 12.3 percent full, respectively, as of May 1965 (Table 3). The annual precipitation ranges from less than 11 inches along the coast to 30 inches just east of Sutherland Reservoir (Plate 5). Additional information concerning the subunits within Unit 5 is presented in Table 10.

Unit 5 lies almost entirely in the mountain-valley physiographic section with a small portion in the coastal plain physiographic section. The coastal plain section consists of the Eocene marine La Jolla Formation. These sediments are in part capped by Pleistocene marine sediments, which have been incised by the San Dieguito River. The alluvial sediments of the San Dieguito River Valley form an important water-bearing formation, as is the La Jolla Formation which locally contains intercalated gypsum beds. The thickness of the alluvium varies, and it reaches a maximum of about 200 feet near San Pasqual (Plate 4B).

Further inland, the mountain-valley section is composed largely of crystalline rocks (Plate 2B): mainly tonalites and granodiorites with some metamorphic rocks, gabbros, and diorites in the easternmost portion of the area. Where fractured and covered by thick residuum, these crystalline rocks are an important source of water. The residuum varies in thickness with the thickest occurrences found in the intermontane basins, such as at Ramona and Santa Ysabel.

More than 250 wells (Plate 6B) provided the information necessary for the evaluation of Unit 5. Depths to water in the coastal plain section are generally less than 25 feet to more than 100 feet. Inland, in the mountain-valley section, depths are usually less than 50 feet (Plate 8B). Ground water is produced from the alluvium and the La Jolla Formation in the coastal plain section and from alluvium, residuum, and fractured crystalline rocks in the inland areas. Most of the wells in residuum are located in the vicinity of Ramona. Wells drilled in the alluvium generally do not exceed 200 feet in depth; but in the crystalline rocks, they have been drilled to a depth of 800 feet and in the La Jolla Formation to nearly 1,000 feet (Plate 3B).

Ground water from the alluvium is generally sodium chloride in character with influences from calcium and bicarbonate ions becoming evident farther inland (Plate 11B). The total dissolved solids content declines from more than 5,000 ppm near the coast to less than 500 ppm inland (Plate 9B).

Water from the La Jolla Formation is generally sodium to calcium chloride in character. The total dissolved solids content generally exceeds 1,000 ppm. This chemical character and total dissolved solids content indicates that connates from these Eocene sediments had been partially flushed out by waters of meteoric origin. Historically, there has been production of ground water from a number of wells in the La Jolla Formation adjacent to the San Dieguito River. Data from these wells suggest a greater movement of connate waters toward the river from further back in the mesa areas. Over-extractions of ground water from the alluvium-filled valley of the San Dieguito River have caused a landward gradient of the water table (Plate 7), which has resulted in sea-water intrusion and connate-water invasion.

Inland, east of Lake Hodges, the major ions are sodium calcium, chloride, and bicarbonate, which reflect the influences of local waste disposal practices and geologic environment. The water around Ramona is essentially sodium chloride in character, reflecting local waste disposal practices and the influence of waste water treatment plant effluent. Further

Del Mar in Unit 5, January 1966

The coastal plain section has been incised by the San Dieguito River.

inland, the ground water is mainly calcium bicarbonate in character (Plate 11B).

Magnesium ions are either major or subordinate constituents of the ground water in local areas, such as north of Lake Hodges and south of Sutherland Reservoir. This is believed to be directly related to the proximity of gabbroic rocks in the highlands. Sutherland Reservoir, which is located adjacent to gabbroic rocks, has historically contained runoff in which magnesium was either the major or subordinate ion (Plate 10).

Ratings of ground water for domestic uses in the coastal plain section are largely inferior because of a high total dissolved solids content and a high sulfate content (Plate 12B). Inland, ratings are generally suitable except for local areas such as north of Lake Hodges and Ramona where high nitrate and high sulfate concentrations have caused the ground water to be rated as marginal to inferior for domestic purposes.

Irrigation use ratings (Plate 13B) of ground water are mainly inferior in the coastal plain section because of a high electrical conductivity and high chloride. Ground water in the interior is generally rated as suitable except locally where it is rated marginal because of high chloride.

PENASQUITOS HYDROLOGIC UNIT (Z-06.00)

Penasquitos Hydrologic Unit (Unit 6) is a triangular-shaped area of about 170 square miles, extending from Poway on the east to La Jolla on the west. There are no major streams in this unit although it is drained by numerous creeks. Miramar Reservoir, the major storage facility, contains only imported Colorado River water (Table 3). Annual precipitation ranges from less than 8 inches along the ocean to 18 inches inland (Plate 5). Poway, La Jolla, Clairmont, and Linda Vista are the major population centers. The University of California at San Diego, established in 1960, has a campus of more than 1,000 acres. Much of the area is used by Camp Mathews, Camp Elliott, and Miramar Naval Reservation. Excluding the part used by the military, most of the area is utilized for urban purposes. Information pertaining to the subunits of Unit 6 is presented in Table 10.

Most of Unit 6 lies within the coastal plain section, except for the northeastern portion which lies within the mountain-valley section. The dominant rocks (Plate 2B) within the coastal plain section are the Eocene marine sediments (La Jolla Formation) which are in part overlain by a relatively thin

La Jolla in Unit 6, January 1966

Most of the unit lies within
the coastal plain section.

cover of Pleistocene marine deposits. The area is incised by numerous canyons that are partially filled with alluvial deposits.

In the northeasternmost portion of the unit, the predominant crystalline rocks (tonalites, granodiorites, and metamorphic rocks) are locally overlain by a relatively thick cover of residuum. In the Poway area, residuum has a maximum thickness of approximately 70 feet. The alluvium is about 110 feet thick in some of the coastal canyons, and the Eocene sediments are more than 800 feet thick (Plate 3B).

Data from more than 70 selected wells (Plate 6B), located mainly in the northwestern part of the unit and in the Poway area, were utilized for the study of this unit. These wells are usually less than 400 feet deep. They produce water mainly from alluvium and the Eocene La Jolla Formation, with depths to water (Plate 8B) generally occurring at less than 50 feet.

The character of the water (Plate 11B) in the coastal area of Unit 6 varies. Usually it is a sodium chloride water with a total dissolved solids content (Plate 9B) ranging from 1,500 to 5,000 ppm. In the Poway area the water is predominantly sodium chloride in character with secondary influences of sulfate. The total dissolved solids content of the ground water ranges from 750 to 1,500 ppm.

The prevailing sodium chloride character of the ground water found both in the mesas and alluvium-filled valleys of this unit can be largely attributed to connate waters, as in the coastal area; and local waste disposal practices, as in the Poway area.

The marked influence of sulfate in ground water locally in the coastal plain section is probably due in part to the influence of intercalated gypsum beds in the La Jolla Formation.

Ground water in the coastal plain section is generally rated suitable to inferior for domestic purposes (Plate 12B), with a high sulfate and total dissolved solids content causing the marginal to inferior ratings. The marginal rating of ground water for domestic purposes in the inland areas is generally due to the high total dissolved solids content.

Ground water toward the coast is generally rated marginal to inferior for irrigation because of a high chloride ion concentration and a high electrical conductivity (Plate 13B). In the area around Poway, ground water is rated suitable to inferior for irrigation, with the marginal and inferior ratings being due to a high chloride content.

SAN DIEGO HYDROLOGIC UNIT (Z-07.00)

San Diego Hydrologic Unit (Unit 7) is a wedge-shaped area of about 440 square miles drained by the San Diego River. El Capitan, San Vicente, Cuyamaca, Chet Harritt, and Murray Reservoirs are the major storage facilities. San Vicente Reservoir (terminus of the First San Diego Aqueduct), Murray Reservoir, and Chet Harritt Reservoir store mainly Colorado River water; whereas El Capitan mainly stores local runoff and some Colorado River water, and Cuyamaca Reservoir stores only local runoff (Table 3).

Much of the impounded water is used to serve major population centers, including a portion of the San Diego metropolitan area and the communities of El Cajon, Santee, Lakeside, Alpine, and Julian. Utilization of the land is largely for urban residential purposes with agricultural uses being secondary. Annual precipitation ranges from less than 11 inches at the coast to about 35 inches around Cuyamaca and El Capitan Reservoirs. Information on the subunits in Unit 7 is presented in Table 10.

The terraced coastal plain section, consisting largely of the Eocene Poway Conglomerate with lesser amounts of alluvium, has been incised by the San Diego River (Plate 2B). Alluvium near the mouth of the San Diego River is approximately 100 feet thick while that near Lakeside attains a thickness of about 200 feet (Plates 3B and 4C).

Inland, in the mountain-valley section, the dominant crystalline rocks consist mainly of tonalites and metamorphic rocks. In addition, there are scattered areas of residuum and alluvium.

More than 250 selected wells, located largely in the El Cajon area (Plate 6B), provided the data for the study of Unit 7. Depths to water in this unit are generally less than 50 feet (Plate 8B) except for a few areas such as east of Lakeside where depths to water are greater than 75 feet. Wells drilled in the alluvium-filled valley near the coast are usually no more than 75 feet deep, but those in the inland area, west of Lakeside, are generally drilled more than 100 feet deep. In addition, some wells have been drilled to depths in excess of 500 feet in fractured crystalline rocks.

The character of the ground water (Plate 11B) in the coastal plain of Unit 7 is sodium-calcium chloride with a total dissolved solids content (Plate 9B) that ranges from 500 to 5,000 ppm.

In the vicinity of Lakeside and El Cajon, the water is generally sodium chloride in character; however, the presence of sulfate and magnesium ions is notable. The sulfate ions are believed to be due to the use of Colorado River water, local irrigation practices, and geologic environment. The presence of magnesium ions is probably due to the presence of Green Valley Tonalite (Plate 2B) which is relatively high in magnesium.

In addition, the dominant sodium and chloride ions in the ground water around Lakeside and El Cajon appear to be from deep-seated hot springs and sewage effluent in conjunction with local waste disposal practices.

Scattered data available for the far inland area indicate the dominance of calcium and magnesium ions. The dominance of these ions is attributed to the presence of gabbroic rocks. The character of runoff in Cuyamaca Reservoir has tended to be calcium-magnesium bicarbonate (Plate 10) which is also indicative of rock type in the watershed. However, the character of water in the other reservoirs has been strongly influenced by the importation of Colorado River water.

The ratings of ground water for domestic use (Plate 12B) in the coastal plain section are generally marginal to inferior because of the high total dissolved solids content. Ground water in the vicinity of El Cajon is rated suitable or inferior for domestic purposes. The inferior rating for domestic

El Capitan Reservoir in Unit 7,
January 1966

El Capitan mainly stores local runoff and some Colorado River water.

use is due to a high nitrate content. In the vicinity of Lakeside, ground water is rated suitable to inferior for domestic purposes. The marginal and inferior ratings are due mainly to high total dissolved solids content and a high sulfate concentration. Ground water in the far inland mountain-valley section is generally rated as suitable for domestic purposes.

Ratings of ground water for irrigation use (Plate 13B) in the coastal section are generally inferior because of high electrical conductivity and a high chloride concentration. Rating of ground water in the El Cajon area is generally marginal to inferior for irrigation purposes because of high chloride. Around Lakeside, ground water is rated suitable to inferior, with the marginal and inferior ratings due to a high chloride content.

CORONADO HYDROLOGIC UNIT (Z-08.00)

Coronado Hydrologic Unit (Unit 8) is a triangular-shaped area of about 60 square miles with no major stream system. It is bordered on the north, roughly, by the watershed of the San Diego River and on the south, in part, by that of the Sweetwater River. The major population center is the City of San Diego. Nearly all the area is occupied by urban residential and industrial developments. The unit is relarively dry with an annual precipitation of less than 11 to 13 inches (Plate 5). Additional information on Unit 8 is presented by subunits in Table 10.

Except for the Point Loma area, which consists of the upper Cretaceous Chico Formation, the terraced coastal plain section is underlain by the Pliocene San Diego Formation and the Eocene Poway Conglomerate (Plate 2C). Marine Pleistocene deposits cap these older sediments except where incised by alluvium-filled canyons. As shown on Plate 3C, several wells penetrate the San Diego Formation and underlying Poway Conglomerate to depths of about 800 feet.

Well data from Unit 8 are sparse. Production of ground water has been obtained from wells drilled into the Tertiary sediments. Depth to water in these wells is more than 100 feet (Plate 8C).

The character of the ground water is essentially sodium bicarbonate and sodium chloride (Plate 11C). Deep wells in the Poway Conglomerate produce bicarbonate water and shallow wells in the San Diego Formation produce chloride water. The chloride water probably reflects the marine origin of the San Diego Formation (connate waters), while

National City, Looking East to
San Diego, in Unit 8, January 1966

The major population center
is the City of San Diego.

the bicarbonate water reflects the continental origin of the Poway Conglomerate or indicates that it has been partially flushed. The ground water from these two formations has a total dissolved solids content (Plate 9C) that ranges from 250 to 750 ppm, with the water obtained from the Poway Conglomerate being in the lower range.

Ground water in Unit 8 is rated as suitable for domestic uses, but only suitable to marginal for irrigation purposes because of the high chloride ion concentration (Plates 12C and 13C).

SWEETWATER HYDROLOGIC UNIT (Z-09.00)

Sweetwater Hydrologic Unit (Unit 9) is an elongated northeasterly trending strip with an area of about 230 square miles. It is traversed along its length by the Sweetwater River. The major population centers include such communities as Chula Vista, Jamul, Spring Valley, and Descanso. Toward the coast land use is largely urban-suburban residential, while inland it is mainly agricultural. The annual precipitation varies from less than 11 inches at the coast to about 35 inches inland (Plate 5). Runoff is stored in Loveland and Sweetwater Reservoirs which were 8.4 and 9.0 percent full as of May 1965 (Table 3). The subunits of Unit 9 are discussed in Table 10.

Unit 9, which is in the coastal plain section, consists of the Pliocene marine San Diego Formation which is capped by Pleistocene marine sediments (Plate 2C). The Pliocene sediments form an important water-bearing formation in the coastal plain section. Ground water is also extracted from the alluvium-filled valley of the Sweetwater River in this area. Further inland, in the mountain-valley section, crystalline rocks are dominant with some alluvium-filled areas present in the larger valleys. Extensive high plateaus occur on the crystalline rock areas, as in the vicinity of Alpine and Descanso.

Ground water is obtained in the mountain-valley section from residuum, fractured crystalline rocks, and from the alluvium-filled valley of the Sweetwater River drainage. Alluvium is generally less than 100 feet thick and the residuum commonly attains thicknesses of more than 100 feet (Plate 3C).

Data on the ground water of this unit are based on approximately 75 wells that have been drilled mainly in the alluvium-filled valley of the Sweetwater River. Depth to water in these wells is generally less than 50 feet (Plate 8C). Wells drilled in the alluvium are generally shallow while those drilled into the San Diego Formation extend to depths of more than 1,000 feet.

In the lower reaches of the Sweetwater River, ground water is sodium-calcium chloride in character (Plate 11C) with a total dissolved solids content that ranges from 2,000 to 5,000 ppm (Plate 9C). The sodium and chloride ions can be attributed to several factors: (1) effluent discharged from the waste water treatment plant (closed in 1963) near the community of Spring Valley, (2) connate waters migrating from the mesa areas into the alluvium-filled valleys, and (3) sea-water intrusion in coastal areas.

Further inland, between Sweetwater and Loveland Reservoirs, the character of the ground water varies greatly. The predominance of sodium and chloride ions in this area is probably due to local waste disposal practices and, possibly, to the influence of hot springs rising along fault zones. Total

Looking East from Alpine
in Unit 9, January 1962

California Division of
Highways

Extensive high plateaus occur
on the crystalline rock areas.

dissolved solids range from 250 to 1,000 ppm. In the furthest inland areas, ground water is calcium bicarbonate in character with a total dissolved solids content of less than 500 ppm.

Ground water in the coastal plain section of this unit is rated inferior for both domestic and irrigation purposes (Plates 12C and 13C). The domestic rating is due to the high total dissolved solids content and the irrigation rating is due to the high chloride ion concentration. Inland, ground water is generally rated as suitable for both domestic and irrigation purposes, except for a few areas where, because of a high boron or chloride ion concentration, the ground water is rated marginal for irrigation uses.

OTAY HYDROLOGIC UNIT (Z-10.00)

Otay Hydrologic Unit (Unit 10) is a club-shaped area of about 160 square miles. The major stream system traversing the area is the Otay River and its tributaries. The Lower Otay Reservoir is the terminus of the Second San Diego Aqueduct. Major population centers include the communities of Imperial Beach and Otay in the coastal area and Dulzura inland. Much of the land is used for irrigated agriculture with urban-residential and commercial uses being secondary. The annual precipitation generally increases landward from the coast and varies from less than 11 to 19 inches (Plate 5). Information on the subunits is presented in Table 10.

The coastal plain section of Unit 10, an area of marine-cut terraces, consists of Pleistocene marine sediments capping the Pliocene marine San Diego Formation (Plate 2C). The maximum thickness of the alluvium is about 200 feet (Plate 3C) in the alluvium-filled valley of the Otay River. The San Diego Formation is generally more than 1,000 feet thick and has been a major water producer. Most of the wells in this formation are 300 to 800 feet deep. In the mountain-valley section, metamorphic rocks predominate with smaller exposures of granodiorite and some areas of residuum and alluvium. Production of water in the mountain-valley section has been largely from residuum and the alluvium-filled valleys.

Data for the study of this unit are based on approximately 80 selected wells as shown on Plate 6C. Production of ground water in the coastal plain section is mainly from the San Diego Formation, where the depth to water in these wells is more than 100 feet (Plate 8C). The depth to water is generally less than 50 feet in the mountain-valley section.

Ground water in the coastal plain section has a sodium-calcium chloride character (Plate 11C) and a total dissolved solids

Lower Otay Reservoir
in Unit 10, January 1966

The southern terminus of the
Second San Diego Aqueduct.

content of 500 to more than 2,000 ppm (Plate 9C). This is attributed mainly to connate water in the San Diego Formation.

Ground water in the mountain-valley section has a TDS content of 250-500 ppm with some local areas as high as 1,000-1,500 ppm. The chemical character is variable, generally sodium-calcium bicarbonate-chloride to sodium-calcium chloride bicarbonate. Locally, high nitrate values are generally associated with waters having high TDS content. The high TDS, nitrate, and chloride values indicate the influence of local waste disposal practices.

The native quality of ground water occurring within Unit 10 can be inferred from the character of the water in Otay

Reservoir before the importation of Colorado River water (Plate 10). These older analyses show the chemical character of the water to be sodium-calcium bicarbonate to sodium-magnesium bicarbonate, which is directly related to the mineral composition of the granodiorites and gabbros which occur in the watershed.

In the coastal plain section, ground water for domestic purposes is rated as suitable to inferior (Plate 12C). The marginal and inferior ratings are due to a high total dissolved solids content; however, in some localities these ratings are due to a high nitrate concentration. Ground water in the mountain-valley section is largely rated as suitable for domestic uses. However, in a few local areas it is rated inferior because of a high nitrate concentration.

For irrigation purposes, ground water in the coastal plain section is rated as marginal to inferior due mainly to a high chloride ion concentration (Plate 13C). The use ratings of ground water for irrigation purposes in the mountain-valley section range from suitable to inferior with the marginal and inferior ratings being essentially due to high chloride.

TIA JUANA HYDROLOGIC UNIT (Z-11.00)

Tia Juana Hydrologic Unit (Unit 11) is a long, wedge-shaped area that is drained by Cottonwood and Campo Creeks, tributaries to the Tia Juana River. It covers an area of about 470 square miles that occurs mainly in the mountain-valley section. The unit is sparsely populated and the major population centers are San Ysidro, Tecate, Potrero, Campo, and Pine Valley. With the exception of San Ysidro, none of these centers is a major urban residential area. The main use of the land is for agricultural purposes.

Annual precipitation, as shown on Plate 5, is less than 11 inches toward the coast, increasing inland to more than 25 inches in the Laguna Mountain area. Runoff is captured by Morena Reservoir and Barrett Lake on Cottonwood Creek. However, due to lack of precipitation, Morena was only 0.7 percent full as of May 1, 1965, and Barrett only 3.5 percent full (Table 3). Further information on the subunits of Unit 11 is presented in Table 10.

The coastal plain section is marked by several terraces in the mesa areas adjacent to the valley of the Tia Juana River. It is made up of Pleistocene marine sediments capping the Pliocene marine San Diego Formation, which are both incised by the partially alluvium-filled valley of the Tia Juana River (Plates 3C and 4C). Production of ground water has

Laguna Mountains, Summit of
Unit 11, January 1966

A spectacular escarpment occurs along the eastern edge of the Laguna Mountains, separating the unit from the Anza Borrego Desert.

been from the alluvium (more than 100 feet thick) in the Tia Juana River area and from the San Diego Formation which is penetrated by deep wells in the mesa area. Locally, the San Diego Formation is intercalated with volcanic tuffs. Inland, the mountain-valley section is made up largely of crystalline rocks which, in order of decreasing areal extent, are tonalites, granodiorites, metamorphics, and gabbros. Several broad, alluvium-filled valleys and large residuum areas occur within this section. A spectacular escarpment occurs along the eastern edge of the Laguna Mountains, separating the unit from the Colorado Desert.

The data for the study of Unit 11 are based on more than 200 selected wells, most of which are located in the valley of the Tia Juana River or the adjacent mesa areas (Plate 6C). Depths to water in the alluvium are generally less than 50 feet, but in the mesa areas depths are generally more than 100 feet (Plate 8C). Wells drilled in alluvium of the Tia Juana River Valley generally range from 30 to 100 feet in depth. In the mesa areas, there are many wells that range from about 800 to 1,400 feet in depth.

Only scattered data are available in the inland alluvium-filled valleys and residuum-covered areas. In Pine Valley, for example, the alluvium is generally less than 100 feet thick and is underlain by residuum. Generally, the wells penetrate alluvium and residuum, and locally, the underlying fractured crystalline rocks.

In the coastal plain section of Unit 11, the water is sodium-calcium chloride in character and the total dissolved solids content ranges from about 750 to more than 5,000 ppm, with the higher values predominating (Plates 9C and 11C). The sodium chloride character of ground water from the Tia Juana River area can be largely attributed to sea-water intrusion and connate water invasion as indicated on Plate 7. Connate water in the San Diego Formation is also responsible for the sodium chloride character of ground water from wells in the mesa areas. The high fluoride concentrations of connate water from the mesa areas may be due to the influence of the volcanic tuffs. Another effect on the water character is the water from a waste water treatment plant near San Ysidro which, in 1962, was discharging a sodium sulfate-chloride water. Secondary influences probably include use of Colorado River water and irrigation, with the attendant application of fertilizers.

Ground water in the mountain-valley section generally shows either a sodium bicarbonate or calcium bicarbonate character (Plate 11C). This chemical character reflects the geologic environment (tonalites-granodiorites) as does the surface water collected in Morena and Barrett Reservoirs (Plate 10).

Ratings of ground water for domestic use in the coastal plain section are largely inferior due to high sulfate and high fluoride concentrations (Plate 12C). Ground water in the coastal plain section is rated as largely inferior for irrigation purposes because of a high electrical conductivity, high chloride concentration, and high percent sodium in the mesa areas (Plate 13C).

Ratings of ground water in the mountain-valley section are essentially suitable for domestic and irrigation purposes except locally where the ground water is rated as marginal.

Appendix A

SELECTED REFERENCES

Appendix A

SELECTED REFERENCES

Babcock, Burt A. "Ground Water Occurrence and Quality, San Diego County". University of Southern California, unpublished Master of Science thesis. June 1958.

Brennan, R. "Reconnaissance Study of the Chemical Quality of Surface Waters in the Sacramento River Basin, California". United States Geological Survey. Water Supply Paper 1619-Q. 1963.

California Department of Public Health. "California Domestic Water Supplies". 1962.

----. "Occurrence of Nitrate in Ground Water Supplies in Southern California". February 1963.

California Department of Public Works, Division of Water Resources. "San Diego County Investigation". Bulletin No. 48. 1935.

----. "Investigation of Possible Boron Pollution from Orange Packing Plants at Escondido". A report to San Diego Regional Water Pollution Control Board (No. 9). March 1952.

----. "Effects of Water Softener Regeneration Wastes, San Diego Region". A report to San Diego Regional Water Pollution Control Board (No. 9). December 1952.

----. "Special Report No. 1 of Referee, Tia Juana Basin". July 1954.

----. "Refuse Disposal Site Investigation, San Diego Region". A report to San Diego Regional Water Pollution Control Board (No. 9). March 1955.

----. "El Cajon Valley Water Quality and Resources, San Diego County". Office Report. December 1955.

----. "Santa Margarita River Investigation". Bulletin No. 57, Volume I: "Text", Volume II: "Appendixes". June 1956.

California Department of Water Resources. "Feather River Project, Investigation of Alternative Aqueduct Routes to San Diego County". Bulletin No. 61, March 1957.

----. "An Investigation of the Water Quality in Mission Basin, San Luis Rey River Valley, San Diego County". A report to the San Diego Regional Water Pollution Control Board (No. 9). May 1958.

----. "Sea-Water Intrusion in California". Bulletin No. 63. November 1958.

California Department of Water Resources. "Orange County Land and Water Use Survey, 1957". Bulletin No. 70. January 1959.

----. "Investigation of Alternative Aqueduct Systems to Serve Southern California". Bulletin No. 78, Appendix B: "Effects of Differences in Water Quality, Upper Santa Ana Valley and Coastal San Diego County". January 1959.

----. "San Dieguito River Investigation". Bulletin No. 72, Volume II: "Appendixes". April 1959.

----. "Industrial Waste Disposal Site, Omar Rendering Company, Otay Valley". A report to San Diego Regional Water Pollution Control Board (No. 9). August 1959.

----. "San Dieguito River Investigation". Bulletin No. 72, Volume I: "Text and Plates". November 1959.

----. "Ground Water Geology, San Diego River Valley". A report to the San Diego Regional Water Pollution Control Board (No. 9). December 1959.

----. "Water Quality Conditions and Effects of Recharge with Sewage Effluent in Mission Basin, San Luis Rey River Valley, San Diego County". A report to the San Diego Regional Water Pollution Control Board (No. 9). December 1960.

----. "Otay Valley Industrial Waste Disposal Site". A report to the San Diego Regional Water Pollution Control Board (No. 9). December 1960.

----. "Nelson Oil Refining Company, Vicinity Mouth of Tia Juana River". A report to the San Diego Regional Water Pollution Control Board (No. 9). May 1962.

----. "Boron Pollution of Ground Water at Escondido". A report to the San Diego Regional Water Pollution Control Board (No. 9). June 1962.

----. "San Diego County Flood Hazard Investigation". Bulletin No. 112, Appendix A: "Regional Flood Frequency Analysis". March 1963.

----. "Third Report on Ground Water Quality Conditions in Mission Basin, San Luis Rey River Valley". A report to the San Diego Regional Water Pollution Control Board (No. 9). April 1963.

----. "San Diego County Land and Water Use Survey, 1958". Bulletin No. 102. August 1963.

----. "Fourth Report on Ground Water Quality Conditions in Mission Basin, San Luis Rey River Valley". A report to the San Diego Regional Water Pollution Control Board (No. 9). September 1963.

California Department of Water Resources. "Fifth Report on Ground Water Quality Conditions in Mission Basin, San Luis Rey River Valley". A report to the San Diego Regional Water Pollution Control Board (No. 9). January 1964.

----. "Names and Areal Code Numbers of Hydrologic Areas in the Southern District". April 1964.

----. "Ground Water Occurrence and Quality, Lahontan Region". Bulletin No. 106-1. June 1964.

----. "Ground Water Quality Survey of Lower Otay River Valley". A report to San Diego Regional Water Pollution Control Board (No. 9). June 1964.

----. "San Juan Creek Ground Water Study". A report to San Diego Regional Water Pollution Control Board (No. 9). September 1964.

----. "San Diego County Flood Hazard Investigation". Bulletin No. 112. September 1964.

----. "Crustal Strain and Fault Movement Investigation". Bulletin No. 116-2. January 1964.

----. "Ground Water Conditions in San Diego River Valley". A report to San Diego Regional Water Pollution Control Board (No. 9). September 1965.

----. "Water Quality Report on Pauma, Pala, and Bonsall Ground Water Basins". A report to San Diego Regional Water Quality Control Board (No. 9). December 1965.

----. "Reclamation of Water from Wastes: Coastal San Diego County". Bulletin No. 80-2, Preliminary Edition. February 1966.

----. "Report on Quantity, Quality, and Use of Waste Water in Southern California, July 1, 1963 - June 30, 1964". April 1966.

----. "Hydrologic Data: 1964". Bulletin No. 134-64, Volume V: "Southern California". August 1966.

California Division of Mines. "Geology of Southern California". Bulletin No. 170. 1954.

----. "Mineral Commodities of California". Bulletin No. 176. 1957.

California Division of Mines and Geology. "Geologic Map of California, San Diego-El Centro Sheet". 1962.

----. "Geologic Map of California, Santa Ana Sheet". 1966.

California State Board of Public Health. "Policy Statement and Resolutions by the State Board of Public Health with Respect to Fluoride Ion Concentrations in Public Water Supplies". August 22, 1958.

----. "Interim Policy on Mineral Quality of Drinking Water". September 4, 1959.

California State Water Resources Board. "Water Utilization and Requirements of California". Bulletin No. 2. June 1965.

California Water Quality Control Board, Department of Water Resources, and Department of Public Health. "Detergent Report: A Study of Detergents in California". Prepared for the California State Legislature. January 1965.

Carpenter, E. J. and Storie, R. E. "Soil Survey of the Capistrano Area, California". United States Department of Agriculture, Bureau of Chemistry and Soils. Soil Survey Report No. 19. 1929.

Carter, George F. "Pleistocene Man at San Diego". Baltimore: Johns Hopkins Press, 1957.

Davis, S. N. and Turk, L. J. "Optimum Depth of Wells in Crystalline Rocks". Ground Water Journal of the National Water Well Association, Volume 2, No. 2. 1964.

Daly, R. A. "Igneous Rocks and the Depths of the Earth". New York: McGraw-Hill Book Company, 1933.

Ellis, A. J. and Lee, C. H. "Geology and Ground Waters of the Western Part of San Diego County, California". United States Geological Survey. Water-Supply Paper No. 446. 1919.

Engel, R., Gay, T. E., Jr., and Rogers, B. L. "Geology and Mineral Deposits of the Lake Elsinore Quadrangle, California". California Division of Mines. Bulletin 146. 1959.

Feth, J. H., Roberson, C. E., and Polzer, W. L. "Sources of Mineral Constituents in Water from Granitic Rocks, Sierra Nevada California and Nevada". United States Geological Survey. Water-Supply Paper 1535-I. 1964.

Fraser, D. M. "Geology of San Jacinto Quadrangle South of San Gorgonio Pass, California". California Division of Mines. Report XXVII of the State Mineralogist, Volume 27, No. 4. October 1931.

Hem, J. D. "Study and Interpretation of the Chemical Characteristics of Natural Water". United States Geological Survey. Water-Supply Paper 1473. 1959.

Holmes, L. C. and Pendleton, R. L. "Reconnaissance Soil Survey of the San Diego Region, California". United States Department of Agriculture, Bureau of Soils. 1918.

Jahns, R. H. and Lance, J. F. "Geology of the San Dieguito Pyrophyllite Area, San Diego County, California". California Division of Mines. Special Report No. 4. November 1950.

Larsen, E. S., Jr. "Batholith and Associated Rocks of Corona, Elsinore, and San Luis Rey Quadrangles, Southern California". Geological Society of America. Memoir 29. June 1948.

Larsen, E. S., Jr., Everhar, D. L., and Merriam, R. "Crystalline Rocks of South Western California". California Division of Mines. Bulletin 159. 1951.

Lewis, D. C. and Burgy, R. H. "Hydraulic Characteristics of Fractured and Jointed Rock". Ground Water Journal of the National Water Well Association, Volume 2, No. 3. 1964.

Mann, J. F., Jr. "Geology of a Portion of the Elsinore Fault Zone, California". California Division of Mines. Special Report No. 43. October 1955.

McMahon, P. J. and Newport, L. H. "Water Supply Development for Rancho Mission Viejo". American Society of Civil Engineers, Irrigation and Drainage Division. Specialty Conference. 1963.

Merriam, R. "Ground Water in the Bedrock in Western San Diego County, California". California State Division of Mines, Bulletin No. 159. 1951.

----. "Geology of Santa Ysabel Quadrangle, San Diego County, California. California Division of Mines. Bulletin 177. 1958.

The Metropolitan Water District of Southern California. "Report for the Fiscal Year 1963 to 1964".

Olmsted, F. H. "Geologic Features and Water Resources of Campo, Mesa Grande, La Jolla, and Pauma Indian Reservations, San Diego County, California". United States Geological Survey, Ground Water Branch. October 1953.

----. "Geologic Reconnaissance of San Clemente Island, California". United States Geological Survey. Bulletin No. 1071. 1956.

Piper, A. M. "A Graphic Procedure in the Geochemical Interpretation of Water Analyses". Transactions of American Geophysical Union, Volume 25. 1944.

Rankama, K. and Sahama, Th. G. "Geochemistry". Chicago: University of Chicago Press, 1950.

Ruxton, B. P. and Berry, L. "Weathering of Granite and Associated Erosional Features in Hong Kong". Bulletin of the Geological Society of America, Volume 68. October 1957.

San Diego County Department of Public Health. "An Inventory of Fluoride Ion Concentration in Parts per Million of Domestic Waters in San Diego County". 1960.

San Diego County Water Authority. "Eighteenth Annual Report". 1964.

----. "Timing of Construction and Sizing of the Second Barrel of the Second San Diego Aqueduct and Proposed Operation of the San Diego County Water System". February 1965.

San Juan Capistrano Soil Conservation District. "Report on Comprehensive Planning for Conservation of Water and Soil Resources for the Aliso Creek Watershed". December 1961.

Scheliga, John T., Jr. "Geology and Water Resources of Warner Basin, San Diego County, California". University of Southern California, unpublished Master of Science thesis. August 1963.

Schoellhamer, J. E., et al. "Geologic Map of the Northern Santa Ana Mountains, Orange and Riverside Counties, California". United States Geological Survey. OM 154. 1954.

Stewart, J. W. "Infiltration and Permeability of Weathered Crystalline Rocks, Georgia Nuclear Laboratory, Dawson County, Georgia". United States Geological Survey. Bulletin 1133-D. 1964.

Storie, R. E. "The Classification and Evaluation of the Soils of Western San Diego County". University of California, Agricultural Experiment Station. Bulletin 552. June 1933.

Storie, R. E. and Carpenter, E. J. "Soil Survey of the Oceanside Area, California". United States Department of Agriculture, Bureau of Chemistry and Soils. No. 11. 1929.

----. "Soil Survey of the El Cajon Area, California". United States Department of Agriculture, Bureau of Chemistry and Soils, Soil Survey Report No. 15. 1930.

Thomas, B. E. "Field Trip Guidebook, San Diego County". San Diego State College, Geology Department. 1961.

United States Department of Health, Education, and Welfare. "Public Health Service Drinking Water Standards". 1962.

Vedder, J. G., Yerkes, R. F., and Schoellhamer, J. E. "Geologic Map of the San Joaquin Hills-San Juan Capistrano Area, Orange County, California". United States Geological Survey. OM 193. 1957.

Waring, G. A. "Springs of California". United States Geological Survey. Water-Supply Paper, No. 338. 1915.

Weber, H. F., Jr. "Geology and Mineral Resources of San Diego County, California". California Division of Mines and Geology. County Report No. 3. 1963.

Werner, Sanford L. "Geohydrochemistry of the San Gabriel Valley Area, Los Angeles County, California". University of Southern California unpublished Master of Science thesis. January 1965.

Appendix B

DEFINITION OF TERMS AS USED IN THIS REPORT

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DEFINITION OF TERMS
AS USED IN THIS REPORT

Acre-foot. The volume of water required to cover one acre one foot in depth (43,560 cubic feet or 325, 851 gallons).

Anion. A negative ion.

Brackish Water. Water containing more than 1,500, but less than 10,000 parts per million of total dissolved solids.

Brine. Water containing more than 36,000 parts per million of total dissolved solids.

Cation. A positive ion.

Chemical Character of Water. A classification of water based on the predominant chemical constituents, in equivalents per million, for the anion and cation groups.

Combining Weight. The atomic or molecular weight of an ion divided by its ionic charge.

Confined Ground Water. A body of ground water overlain by material sufficiently impervious to sever free hydraulic connection with overlying ground water, except at the area of recharge. Confined ground water moves in conduits under pressure due to the difference in head between the intake and discharge areas of the confined water body.

Connate Water. Water entrapped in the interstices of sedimentary rock at the time the sediments were deposited. This water may be fresh, brackish, or saline in character.

Contamination. Defined in Section 13005 of the California Water Code: "an impairment of the quality of the waters of the State by sewage or industrial waste to a degree which creates an actual hazard to public health through poisoning or through the spread of disease . . . ."

Degradation. Impairment of the quality of water due to causes other than disposal of sewage and industrial waste.

Deterioration. Impairment of water quality.

Electrical Conductivity (E.C.). The reciprocal of the resistance in ohms measured between opposite faces of a centimeter cube of an aqueous solution at a temperature of 25 degrees centigrade.

Equivalent Weight. The value, usually expressed as equivalents per million, obtained by dividing the ion concentration in parts per million by the combining weight of that ion.

Felsenmeer. Defined for this report as a large area resembling a sea of rocks or block field and composed of large subrounded blocks of crystalline bedrock which have remained in situ after the weathering processes have removed the residual matrix. This differs from the original definition which is related to frost heaving.

Geohydrochemistry. A study of the chemical quality of the surface and ground water as it is influenced by the geologic and hydrologic environments and modified by the activities of man.

Hydraulic Gradient. Under unconfined ground water conditions, the slope of the profile of the water table. Under confined ground water conditions, it is the slope of the piezometric surface.

Hydrologic Unit. A classification embracing one of the following features which are defined by surface drainage divides: (1) In general, the total watershed area, including water-bearing and nonwater-bearing formations, such as the total drainage area of the San Diego River Valley; and (2) in coastal areas, two or more small contiguous watersheds having similar hydrologic characteristics, each watershed being directly tributary to the ocean and all watersheds emanating from one mountain body located immediately adjacent to the ocean.

Hydrologic Subunit. A major logical subdivision of a hydrologic unit which includes both water-bearing and nonwater-bearing formations. It is best typified by a major tributary of a stream, a major valley, or a plain along a stream containing one or more ground water basins and having closely related geologic, hydrologic, and topographic characteristics. Subunit boundaries are based primarily on drainage boundaries. However, where strong subsurface evidence indicates that a division of ground water exists, the subunit boundary may be based on subsurface characteristics.

Impairment. A change in quality of water which decreases its suitability for beneficial use.

Industrial Waste. Defined in Section 13005 of the California Water Code: "any and all liuquid or solid water substances, not sewage, from any producing, manufacturing or processing operation of whatever nature".
See correction sheet in front of book.

Overdraft. The average annual decrease in the amount of ground water in storage that occurs during a long period, under a particular set of physical conditions affecting the supply, use, and disposal (including extractions) of water in the ground water reservoir.

Parts Per Million (ppm). One weight of dissolved substance per one million weights of solution at a temperature of 20 degrees centigrade. For practical purposes, ppm is the same as milligrams per liter (mg/l).

Percent Reactance Value. The value, expressed in percent, obtained by dividing the equivalents per million of each ion by the sum of its respective ion group (i.e. the cations or anions).

Percolation. The movement of water through the interstices of soil or other porous media.

Permeability. The capacity of a rock to transmit a fluid. Degree of permeability depends upon the size and shape of the pores, and upon the size, shape, and extent of the pore interconnections.

Pollution. Defined in Section 13005 of the California Water Code: "An impairment of the quality of the waters of the State by sewage or industrial waste to a degree which does not create an actual hazard to the public health but which does adversely and unreasonably affect such waters for domestic, industrial, agricultural, navigational, recreational, or other beneficial use, or which does adversely and unreasonably affect the ocean waters and bays of the State devoted to public recreation."

Residuum. The residual material formed in situ from weathering of the crystalline bedrock. Residuum includes residual soils, gruss, and decomposed granite.

Saline Water. Water containing more than 10,000, but less than 36,000 parts per million total dissolved solids.

Salt Balance. The relationship of salt input to salt output.

San Diego Region. An area consisting largely of the western watershed of San Diego County and smaller portions of Orange and Riverside Counties. This area is the same as that under the jurisdiction of the San Diego Regional Water Quality Control Board and is also known as the San Diego Drainage Province.

Sewage. Defined in Section 13005 of the California Water Code: "Any and all waste substance, liquid or solid, associated with human habitation, or which contains or may be contaminated with human or animal excreta or excrement, offal, or any feculent matter." As used in this report, sewage is included as part of the waste waters carried by community sewer systems.

Specific Capacity. The number of gallons per minute per foot of drawdown from a pumping well.

Total Dissolved Solids (TDS). The dry residue from the dissolved matter in an aliquot of a water sample remaining after evaporating the sample at a definite temperature.

Total Dissolved Solids by Summation. The TDS as determined by summing the individual dissolved constituents, less one-half the bicarbonate ion.

Total Radioactivity. The combination of alpha, beta, and gamma activity in water reported in picocuries per liter (10^{-12}curies/liter) or 2.22 disintegrations per minute per liter.

Unconfined Ground Water. Ground water in the zone of saturation not confined beneath an impervious formation and moving under the control of the water table slope.

Water Utilization. The use of all waters by nature or man, whether consumptive or nonconsumptive, including that portion of the applied water which is irrecoverably lost.

Waste Water. Water that has been put to some use or uses and has been disposed of, commonly to a sewer or wasteway. It may be liquid industrial waste or sewage or both.

Appendix C

STATE WELL NUMBERING SYSTEM

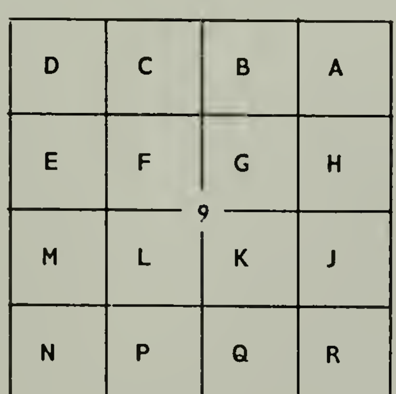
Appendix C

STATE WELL NUMBERING SYSTEM

Data from monitored wells and springs presented in this report are assigned numbers which are referenced by the U. S. Public Land Survey System. The well number consists of the township, range, and section numbers; a letter to indicate the 40-acre lot in which the well is located; a number to identify the particular well in the 40-acre lot; and a terminal letter (S) to indicate the San Bernardino Base and Meridian.

Springs are assigned well numbers on the same basis as are water wells, but the letter S is inserted immediately after the lot identification. For example, spring 10S/3W-11GS6, S is the sixth spring assigned a number in Lot G of Section 11 of Township 10 South, Range 3 West, San Bernardino Base and Meridian.

Sections are subdivided into 40-acre lots as shown below



For example, well 11S/4W-9E1, S denotes the first well to be assigned a number in Lot E of Section 9 of Township 11 South, Range 4 West, San Bernardino Base and Meridian.

Appendix D

CHEMICAL ANALYSES OF GROUND WATER FROM SELECTED WELLS

SAN JUAN HYDRO UNIT 20100

LAGUNA HYDRO SUBUNIT 201A0

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
6S/ 7W- 4E 1 S	--	7.5	1910	100	70	220	1	0	425	454	135	2.7	2.0	1.20	21		538
6-12-61				4.99	5.76	9.57	0.03		6.97	9.45	3.81	0.04				1332	
				25	28	47			34	47	19					1216	
7S/ 8W-16D 1 S	82	8.1	1945	6	4	442	10	0	602	81	284	0	0.9	3.90	23		32
6- 7-61				0.30	0.33	19.22	0.26		9.87	1.69	8.01					1156	
				1	2	96	1		50	9	41					1151	
7S/ 8W-16D 1 S	--	7.8	2150	104	63	315	2	0	522	326	296	5.5	1.0	0.58	20	1416	519
8-22-63				5.19	5.18	13.70	0.05		8.56	6.79	8.35	0.09					
				22	21	57			36	29	35					1390	
7S/ 8W-32L 1 S	--	7.6	5680	224	107	919	11	0	533	1826	526	12	1.2	1.64	18		1000
12- 5-60				11.18	8.80	39.96	0.28		8.74	38.02	14.83	0.19				4130	
				19	15	66			14	62	24					3908	
7S/ 8W-33G 1 S	--	7.4	1085	34	33	123	14	0	327	88	105	1.8	0.3	0.53	31		221
6-20-61				1.70	2.71	5.35	0.36		5.36	1.83	2.96	0.03				796	
				17	27	53	4		53	18	29					591	
7S/ 9W-13J 1 S	67	7.7	1810	99	63	200	2	0	677	144	190	1.7	1.2	0.51	30		506
10-20-55				4.94	5.18	8.70	0.05		11.10	3.00	5.36	0.03					
				26	27	46			57	15	28					1064	
SAN JUAN HYDRO SUBUNIT 201B0																	
6S/ 5W-17H 1 S	59	7.3	710	60	24	54	2	0	245	111	43	0	0.2	0.13	--	515	248
6-25-64				2.99	1.97	2.35	0.05		4.02	2.31	1.21						
				41	27	32	1		53	31	16					415	
6S/ 7W-11J 1 S	--	7.4	807	92	35	28	1	0	248	205	16	0	0.1	0.08	22	574	374
5-29-64				4.59	2.88	1.22	0.03		4.06	4.27	0.45						
				53	33	14			46	49	5					521	
6S/ 7W-11N 2 S	76	7.4	756	104	22	28	1	0	238	183	22	0.9	0.2	0.09	20		350
11-17-60				5.19	1.81	1.22	0.03		3.90	3.81	0.62	0.01				508	
				63	22	15			47	46	7					498	
6S/ 7W-11P 1 S	70	7.8	760	114	17	27	1	0	220	199	23	1.8	0.2	0.14	21		355
11-17-60				5.69	1.40	1.17	0.03		3.61	4.14	0.65	0.03				464	
				69	17	14			43	49	8					512	
6S/ 7W-12B 2 S	--	7.7	753	83	31	24	1	0	222	191	14	0	0.1	0.06	19	517	335
5-29-64				4.14	2.55	1.04	0.03		3.64	3.98	0.39						
				53	33	13			45	50	5					472	
6S/ 7W-12F 1 S	--	8.2	521	77	7	19	1	10	185	63	16	0.9	0	0.06	--	336	221
5-29-64				3.84	0.58	0.83	0.03	0.33	3.03	1.31	0.45	0.01					
				73	11	16	1	6	59	26	9					285	
6S/ 7W-15A 1 S	--	7.2	1082	155	33	41	2	0	327	258	46	12	0.2	0.19	21		522
11-14-60				7.73	2.71	1.78	0.05		5.36	5.37	1.30	0.19				804	
				63	22	15			44	44	11	2				729	
6S/ 7W-15A 2 S	65	7.8	1065	148	33	40	2	0	317	249	49	19	0.2	0.20	20		505
11-14-60				7.39	2.71	1.74	0.05		5.20	5.18	1.38	0.31				798	
				62	23	15			43	43	11	3				716	
6S/ 7W-17PS1 S	--	8.1	1400	158	43	120	6	--	308	390	124	0.7	0	0.25	20		571
6-19-64				7.88	3.54	5.22	0.15		5.05	8.12	3.50	0.01				1176	
				47	21	31	1		30	49	21					1013	
6S/ 8W-26B 2 S	--	7.6	1848	112	76	180	3	0	380	434	175	0	0.3	0.13	31	1278	592
5-29-64				5.59	6.25	7.83	0.08		6.23	9.04	4.94						
				28	32	40			31	45	24					1198	
7S/ 6W- 4ES1 S	--	9.3	--	4	0	88	1	--	--	24	70	--	8.0	--	--		10
9- 2-64				0.20		3.83	0.03			0.50	1.97					315	
7S/ 7W- 9G 1 S	--	7.9	585	54	6	62	0	0	177	21	78	16	0.6	0.17	37		159
6-15-61				2.69	0.49	2.70			2.90	0.44	2.20	0.26				378	
				46	8	46			50	8	38	4				362	
7S/ 7W-14H 1 S	--	7.5	550	37	2	80	0	0	159	46	67	0	0.8	0.22	30		101
10-20-61				1.85	0.16	3.48			2.61	0.96	1.89					296	
				34	3	63			48	18	35					341	
7S/ 7W-19D 2 S		7.4	742	103	13	35	2	--	254	138	27	0.7	0.5	0.04	21	512	311
10-21-63				5.14	1.07	1.52	0.05		4.16	2.87	0.76	0.01					
				66	14	20	1		53	37	10					465	
7S/ 7W-32Q 1 S	--	6.9	1023	88	29	90	1	0	205	227	82	1.0	0.5	0.39	20		339
11-10-60				4.39	2.38	3.91	0.03		3.36	4.73	2.31	0.02				638	
				41	22	37			32	45	22					640	
7S/ 7W-32R 1 S		7.3	1374	74	14	192	2	0	267	198	178	5.7	0.8	0.47	24	831	242
1- 8-64				3.69	1.15	8.35	0.05		4.38	4.12	5.02	0.09					
				28	9	63			32	30	37	1				820	

SAN JUAN HYDRO UNIT Z0100

SAN JUAN HYDRO SUBUNIT Z0180

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
7S/ 7W-34NS1 S	95	8.0	870	55	26	63	2	0	254	64	72	11	0.6	0.08	--	440	244
6-25-64				2.74	2.14	2.74	0.05		4.16	1.33	2.03	0.18					
				36	28	36	1		54	17	26	2				418	
7S/ 7W-35J 1 S	--	6.9	540	44	10	42	2	0	88	53	82	6.8	0.5	0.14	16	298	151
6-20-61				2.20	0.82	1.83	0.05		1.44	1.10	2.31	0.11					
				45	17	37	1		29	22	47	2				300	
7S/ 7W-36A 1 S	--	7.1	736	65	25	--	--	0	220	108	55	--	--	--	--		265
5-15-64				3.24	2.06				3.61	2.25	1.55						
7S/ 8W- 10 1 S	77	7.9	2541	217	71	235	13	--	477	462	361	--	--	0.07	--		834
12-13-62				10.83	5.84	10.22	0.33		7.82	9.62	10.18					1703	
7S/ 8W-13GS1 S	--	7.3	1600	145	51	178	13	0	384	348	213	0	0.8	0.33	23		572
6-19-64				7.24	4.19	7.74	0.33		6.29	7.25	6.01					1251	
				37	21	40	2		32	37	31					1161	
7S/ 8W-25B 1 S	77	7.9	711	85	19	34	2	--	203	135	41	--	--	0	--		290
11-29-62				4.24	1.56	1.48	0.05		3.33	2.81	1.16					467	
7S/ 8W-25B 2 S		7.1	788	99	19	37	1	0	227	145	46	1.8	0.3	0.05	18	532	325
1- 8-64				4.94	1.56	1.61	0.03		3.72	3.02	1.30	0.03					
				61	19	20			46	37	16					479	
7S/ 8W-25B 3 S		7.2	794	100	20	35	1	0	222	153	48	1.6	0.3	0.02	18	517	332
1- 8-64				4.99	1.64	1.52	0.03		3.64	3.19	1.35	0.03					
				61	20	19			44	39	16					486	
7S/ 8W-25B 4 S		7.2	794	101	19	40	1	0	244	145	44	2.4	0.3	0.05	23	524	330
1- 8-64				5.04	1.56	1.74	0.03		4.00	3.02	1.24	0.04					
				60	19	21			48	36	15					496	
7S/ 8W-25L 1 S	--	7.9	990	123	24	47	2	0	205	200	88	5.8	0.1	0.15	24		406
6-12-61				6.14	1.97	2.04	0.05		3.36	4.16	2.48	0.09				762	
				60	19	20			33	41	25	1				615	
7S/ 8W-25N 1 S	67	7.7	4095	282	136	470	2	0	311	1305	510	2.3	0.6	0.44	7		1264
11-14-60				14.07	11.18	20.44	0.05		5.10	27.17	14.38	0.04				3106	
				31	24	45			11	58	31					2868	
7S/ 8W-25N 2 S	--	7.9	1081	127	28	--	--	0	253	227	76	--	--	--	--		432
5-14-64				6.34	2.30				4.15	4.73	2.14						
7S/ 8W-25N 3 S	--	7.4	1080	130	24	106	--	0	268	300	80	--	0	0.10	14	70	423
2-15-61				6.49	1.97	4.61			4.39	6.25	2.26						
7S/ 8W-36C 1 S		7.2	869	105	24	39	2	--	239	170	51	11	0.3	0.05	20	586	361
10-21-63				5.24	1.97	1.70	0.05		3.92	3.54	1.44	0.18					
				58	22	19	1		43	39	16	2				540	
7S/ 8W-36L 2 S		7.3	1484	125	40	122	3	--	256	327	132	12	0.3	0.04	20	1022	477
10-21-63				6.24	3.29	5.30	0.08		4.20	6.81	3.72	0.19					
				42	22	36	1		28	46	25	1				907	
7S/ 8W-36P 3 S		7.2	1240	180	7	80	2	--	264	283	91	15	0.3	0.06	20	856	478
10-21-63				8.98	0.58	3.48	0.05		4.33	5.89	2.57	0.24					
				69	4	27			33	45	20	2				808	
7S/ 8W-36P 4 S	--	8.0	1452	143	35	--	--	0	263	355	129	--	--	--	--		501
5-14-64				7.14	2.88				4.31	7.39	3.64						
8S/ 7W- 5B 1 S	--	8.0	1375	92	24	176	3	0	262	189	202	8.7	0.7	0.33	20	871	328
12-11-61				4.59	1.97	7.65	0.08		4.29	3.93	5.70	0.14					
				32	14	54	1		31	28	41	1				845	
8S/ 7W- 5C 2 S		7.7	1653	149	40	159	4	--	287	422	139	--	0.7	0.17	23	1176	537
10-21-63				7.44	3.29	6.91	0.10		4.70	8.79	3.92						
8S/ 7W- 5E 1 S	--	8.0	1129	110	31	--	--	0	218	290	80	--	--	--	--		402
5-14-64				5.49	2.55				3.57	6.04	2.26						
8S/ 7W- 5E 2 S	--	7.1	1400	126	39	140	3	0	247	373	124	6.2	0.7	0.40	22		475
9-28-61				6.29	3.21	6.09	0.08		4.05	7.77	3.50	0.10				1266	
				40	20	39	1		26	50	23	1				956	
8S/ 7W- 6H 1 S		7.1	1955	216	50	146	3	0	281	593	181	0	0.5	0.27	23	1424	745
1- 8-64				10.78	4.11	6.35	0.08		4.61	12.35	5.10						
				51	19	30			21	56	23					1351	
8S/ 7W- 6H 3 S	--	8.0	1848	175	48	--	--	0	203	582	161	--	--	--	--		635
5-14-64				8.73	3.95				3.33	12.12	4.54						

State well number Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million / equivalents per million / percent reactance value: Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Carbonate (CO_3)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Chemical constituents in parts per million: Fluoride (F)	Boron (B)	Silica (SiO_2)	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
SAN JUAN HYDRO UNIT 20100																	
SAN JUAN HYDRO SUBUNIT 20180																	
8S/ 7W- 6J 2 S 5-14-64	--	7.9	1974	189 9.43	46 3.78	--	--	0	278 4.56	575 11.97	189 5.33	--	--	--	--		661
8S/ 7W- 6J 5 S 1- 8-64		7.4	1882	188 9.38 46	49 4.03 20	160 6.96 34	3 0.08	0	281 4.61 22	532 11.08 53	182 5.13 24	7.7 0.12 1	0.5	0.24	23	1340 1284	671
8S/ 7W- 6K 2 S 5-14-64	--	7.7	1723	182 9.08	46 3.78	--	--	0	264 4.33	536 11.16	143 4.03	--	--	--	--		644
8S/ 7W- 6K 3 S 11-30-62	77	7.3	2118	189 9.43	73 6.00	186 8.09	4 0.10	--	314 5.15	591 12.30	207 5.84	--	--	0.06	--	1606	772
8S/ 7W- 6P 1 S 12-16-58	66	6.9	1585	150 7.49 44	43 3.54 21	133 5.78 34	8 0.20 1	0	207 3.39 20	423 8.81 53	154 4.34 26	4.2 0.07	0.5	0.21	19	1092 1037	552
8S/ 7W- 7C 2 S 12-11-61	--	7.9	1150	110 5.49 45	33 2.71 22	93 4.04 33	3 0.08 1	0	156 2.56 21	315 6.56 54	105 2.96 24	4.3 0.07 1	0.5	0.24	5	765 746	410
8S/ 7W- 7C 3 S 11-30-62	77	7.1	782	73 3.64	21 1.73	56 2.43	2 0.05	--	184 3.02	186 3.87	45 1.27	--	--	0.05	--	545	269
8S/ 7W- 7D 1 S 11-30-62	77	7.2	2074	229 11.43	56 4.61	140 6.09	6 0.15	--	456 7.47	568 11.83	217 6.12	--	--	0.31	--	1557	803
8S/ 8W- 1K 1 S 11-29-62	77	7.8	1640	229 11.43	40 3.29	80 3.48	3 0.08	--	306 5.02	430 8.95	160 4.51	--	--	0.25	--	1173	737
8S/ 8W- 1K 2 S 4-25-62	--	7.1	1524	186 9.28 55	41 3.37 20	95 4.13 24	3 0.08	0	284 4.65 27	390 8.12 48	147 4.15 24	9 0.15 1	0.4	0.06	22	1110 1033	633
8S/ 8W- 1L 1 S 5-14-64	--	8.0	1564	187 9.33	36 2.96	--	--	0	285 4.67	402 8.37	140 3.95	--	--	--	--		615
8S/ 8W- 1L 2 S 11-29-62	77	7.9	1865	240 11.98	50 4.11	92 4.00	4 0.10	--	288 4.72	497 10.35	206 5.81	--	--	0.27	--	1363	805
8S/ 8W- 1Q 5 S 11-29-62	77	7.8	1882	236 11.78	59 4.85	86 3.74	5 0.13	--	309 5.06	511 10.64	199 5.61	--	--	0.45	--	1432	832
8S/ 8W-12B 1 S 12-13-62	77	7.9	1271	138 6.89	37 3.04	73 3.17	9 0.23	--	257 4.21	271 5.64	130 3.67	--	--	0.04	--	842	497
8S/ 8W-12C 1 S 11-10-60	--	7.5	1642	275 13.72 65	44 3.62 17	82 3.57 17	2 0.05	0	332 5.44 29	464 9.66 51	129 3.64 19	3.2 0.05	0.3	0.18	19	1118 1182	868
8S/ 8W-12K 1 S 7-11-52	--	7.2	--	153 7.63	35 2.88	73 3.17	2 0.05	--	288 4.72	296 6.16	108 3.05	--	0.1	0.00	--	811	526
8S/ 8W-12L 1 S 10-21-63		7.4	1848	212 10.58 51	51 4.19 20	131 5.70 28	3 0.08	--	378 6.20 30	480 9.99 48	161 4.54 22	1.1 0.02	0.4	0.10	19	1337 1244	739
8S/ 8W-12L 2 S 8-14-62	77	8.4	1723	19 0.95	84 6.91	220 9.57	10 0.26	39 1.30	473 7.75	126 2.62	258 7.28	--	--	0	--	1206	393
8S/ 8W-12L 3 S 1- 8-64		7.6	1882	236 11.78 53	48 3.95 18	147 6.39 29	3 0.08	0	389 6.38 29	508 10.58 48	180 5.08 23	0	0.3	0.18	19	1364 1333	787
8S/ 8W-12L 4 S 5-14-64	--	8.1	1540	186 9.28	38 3.13	--	--	0	353 5.79	389 8.10	121 3.41	--	--	--	--		621
8S/ 8W-12P 1 S 8-16-62	77	7.3	1815	231 11.53	48 3.95	108 4.70	3 0.08	--	397 6.51	502 10.45	148 4.17	--	--	0	--	1271	775
8S/ 8W-12P 2 S 10-31-61	--	7.1	1955	252 12.57	53 4.36	138 6.00	6 0.15	--	372 6.10	563 11.72	180 5.06	--	--	0.08	--	1472	847
8S/ 8W-12P 3 S 11-29-62	77	8.0	1815	213 10.63	56 4.61	102 4.43	2 0.05	--	377 6.18	497 10.35	141 3.98	--	--	0.25	--	1357	763

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
SAN JUAN HYDRO UNIT 20100																	
SAN JUAN HYDRO SUBUNIT 20180																	
8S/ 8W-12P 4 S	--	7.6	1910	188	63	201	4	0	314	652	170	9.3	0.7	0.18	23	1468	729
12-11-61				9.38	5.18	8.74	0.10		5.15	13.57	4.79	0.15					
				40	22	37			22	57	20	1				1465	
8S/ 8W-130 1 S	77	7.3	2054	205	78	145	5	--	392	605	168	--	--	0.06	--		833
12-13-62				10.23	6.41	6.30	0.13		6.42	12.60	4.74					1493	
8S/ 8W-14H 2 S	--	7.9	2747	309	86	--	--	0	343	777	331	--	--	--	--		1125
5-14-64				15.42	7.07				5.62	16.18	9.33						
8S/ 8W-14H 3 S	66	7.4	2000	260	57	142	4	--	381	581	202	3.0	0.4	0.19	21		884
8-12-59				12.97	4.69	6.17	0.10		6.24	12.10	5.70	0.05				1539	
				54	20	26			26	50	24					1458	
8S/ 8W-14J 1 S	--	7.5	--	143	32	79	3	--	322	265	100	--	0.1	0.36	--		489
7-11-52				7.14	2.63	3.43	0.08		5.28	5.52	2.82					783	
8S/ 8W-140 1 S	--	7.2	4500	480	159	404	6	0	511	1069	830	2.5	0.8	0.31	--	3626	1853
8-27-64				23.95	13.08	17.57	0.15		8.38	22.26	23.41	0.04					
				44	24	32			15	41	43					3203	
8S/ 8W-23A 2 S	70	7.2	2008	219	63	160	3	0	366	544	214	3.0	0.4	0.20	25	1490	806
7-16-58				10.93	5.18	6.96	0.08		6.00	11.33	6.03	0.05					
				47	22	30			26	48	26					1412	
8S/ 8W-23A 3 S	72	7.4	1630	228	53	128	5	0	327	498	202	0	0.1	0.22	18	1472	788
5-18-61				11.38	4.36	5.57	0.13		5.36	10.37	5.70						
				53	20	26	1		25	48	27					1293	
8S/ 8W-23A 4 S	--	7.3	2748	294	97	252	4	0	393	895	287	0.7	0.8	0.27	--	2188	1133
8-27-64				14.67	7.98	10.96	0.10		6.44	18.63	8.09	0.01					
				44	24	33			19	56	24					2024	
8S/ 8W-23A 7 S		7.7	1993	218	52	165	6	0	324	531	220	0	0.3	0.04	12	1381	759
2-21-64				10.88	4.28	7.17	0.15		5.31	11.06	6.20						
				48	19	32	1		24	49	27					1364	
SAN CLEMENTE HYDRO SUBUNIT 201C0																	
9S/ 7W-10A 1 S	77	7.4	780	54	26	81	3	0	190	114	99	0.0	0.6	0.14	--	630	242
11-23-64				2.69	2.14	3.52	0.08		3.11	2.37	2.79						
				32	25	42	1		38	29	34					471	
9S/ 7W-10A 2 S	--	7.9	800	48	29	99	4	0	204	122	188	0	0.4	0.20	24	552	239
10-23-63				2.40	2.38	4.30	0.10		3.34	2.54	5.30						
				26	26	47	1		30	23	47					615	
9S/ 7W-10A 3 S	--	7.7	850	49	34	87	4	0	210	147	96	0	0.2	0.15	--	556	263
7-20-64				2.45	2.80	3.78	0.10		3.44	3.06	2.71						
				27	31	41	1		37	33	29					521	
9S/ 7W-10E 1 S	--	7.1	15600	782	927	4517	82	0	21	1224	1035	1.9	0.3	1.00	6	20410	5768
9-12-63				39.02	76.24	196.40	2.10		0.34	25.48	29.19	0.03					
				12	24	63	1		1	46	53					8587	
9S/ 7W-10E 2 S	--	7.9	755	44	26	78	4	0	204	100	76	2.5	0.4	0.15	30	438	217
9-12-63				2.20	2.14	3.39	0.10		3.34	2.08	2.14	0.04					
				28	27	43	1		44	27	28	1				461	
9S/ 7W-10G 1 S	74	7.5	903	60	30	71	4	0	197	116	110	0	0.6	0.33	22	610	273
7-13-59				2.99	2.47	3.09	0.10		3.23	2.42	3.10						
				35	29	36	1		37	28	35					511	
9S/ 7W-10H 1 S	77	7.4	760	46	24	78	4	0	212	94	78	0.0	0.2	0.15	--	466	214
11-23-64				2.30	1.97	3.39	0.10		3.47	1.96	2.20						
				30	25	44	1		45	26	29					429	
SAN MATEO HYDRO SUBUNIT 20100																	
9S/ 7W-11A 1 S	--	7.9	590	46	19	58	1	0	171	79	67	11	0.2	0.18	23	394	193
10-24-63				2.30	1.56	2.52	0.03		2.80	1.64	1.89	0.18					
				36	24	39			43	25	29	3				388	
9S/ 7W-11F 1 S	68	--	742	--	--	--	--	--	--	--	100	--	--	0.10	--		244
4-30-59											2.82						
9S/ 7W-11P 1 S	68	7.0	647	55	16	55	2	0	182	--	63	--	--	--	--		203
10-29-57				2.74	1.32	2.39	0.05		2.98		1.78						
9S/ 7W-14B 1 S	68	7.0	605	51	20	49	1	0	180	--	60	--	--	--	--		209
10-29-57				2.54	1.64	2.13	0.03		2.95		1.69						

State well number Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C Evap 105°C Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
SAN JUAN HYDRO UNIT 20100																	
SAN MATEO HYDRO SUBUNIT 20100																	
9S/ 7W-14F 1 S 4-28-59	67	--	866	--	--	--	--	--	--	--	115 3.24	--	--	0.20	--		314
9S/ 7W-14G 1 S 10-24-63	64	8.2	750	64 3.19 39	24 1.97 24	69 3.00 37	1 0.03	0	207 3.39 41	100 2.08 25	98 2.76 33	6.3 0.10 1	0.2	0.23	23	506 487	258
9S/ 7W-14L 1 S 10-24-63	64	7.1	1060	74 3.69 30	50 4.11 34	100 4.35 36	2 0.05	0	212 3.47 28	220 4.58 38	147 4.15 34	0	0.4	0.20	19	600 717	390
9S/ 7W-14M 1 S 10-29-57	67	6.9	691	58 2.89	19 1.56	56 2.43	2 0.05	0	181 2.97	--	69 1.95	--	--	--	--		223
SAN ONOFRE HYDRO SUBUNIT 201E0																	
9S/ 6W-18Q 1 S 4-28-59	66	--	772	--	--	--	--	--	--	--	76 2.14	--	--	0.20	--		248
9S/ 6W-19D 1 S 9- 8-60	72	6.9	977	87 4.34 44	25 2.06 21	78 3.39 34	2 0.05 1	0	216 3.54 36	118 2.46 25	129 3.64 37	11.8 0.19 2	0.5	0.35	35	612 593	320
9S/ 7W-13P 1 S 5-26-53	66	--	888	58 2.89	35 2.88	--	--	--	--	--	91 2.57	0.7 0.01	--	--	--		289
9S/ 7W-14R 2 S 10-12-53	68	7.2	1140	86 4.29	28 2.30	112 4.87	4 0.10	0	274 4.49	--	130 3.67	30 0.48	--	--	--		330
9S/ 7W-14R 3 S 4-23-58	69	--	573	--	--	--	--	--	--	--	68 1.92	--	--	--	--		188
9S/ 7W-24A 1 S 9-14-56	73	7.5	990	96 4.79 46	23 1.89 18	84 3.65 35	2 0.05	0	238 3.90 39	127 2.64 26	119 3.36 34	7.4 0.12 1	0.2	0.26	--	627 576	334
9S/ 7W-24C 1 S 4-28-59	66	--	864	--	--	--	--	--	--	--	93 2.62	--	--	0.10	--		284
9S/ 7W-24D 1 S 4-30-59	67	--	929	--	--	--	--	--	--	--	110 3.10	--	--	0.20	--		308
SAN ONOFRE HYDRO SUBUNIT 201E0																	
9S/ 7W-24H 1 S 10-28-55	68	7.9	857	42 2.10	38 3.13	76 3.30	2 0.05	0	190 3.11	--	96 2.71	--	--	--	--		262
10S/ 5W-18M 3 S 10-30-57	71	7.5	1320	77 3.84	36 2.96	154 6.70	2 0.05	0	337 5.52	--	202 5.70	--	--	--	--		340
10S/ 5W-18M 4 S 4-28-59	67	--	1340	--	--	--	--	--	--	--	192 5.41	--	--	0.50	--		300
10S/ 5W-19E 1 S 10-29-53	66	7.4	1370	81 4.04	50 4.11	142 6.17	4 0.10	0	368 6.03	--	187 5.27	3.8 0.06	--	--	--		408
10S/ 5W-31A 1 S 10-30-57	69	7.2	1530	72 3.59	82 6.74	137 5.96	2 0.05	0	340 5.57	--	240 6.77	--	--	--	--		517
10S/ 6W-13Q 2 S 10-30-57	65	7.7	1230	74 3.69	42 3.45	136 5.91	2 0.05	0	358 5.87	--	168 4.74	--	--	--	--		357
10S/ 6W-24G 2 S 10-29-57	75	7.7	1340	41 2.05	34 2.80	200 8.70	12 0.31	0	305 5.00	--	226 6.37	--	--	--	--		243
SANTA MARGARITA HYDRO UNIT 20200																	
YSIDORA HYDRO SUBUNIT 202A0																	
9S/ 3W-18K 1 S 7-27-62	70	7.4	1420	86 4.29 30	69 5.67 39	103 4.48 31	2 0.05	0	145 2.38 16	291 6.06 41	207 5.84 40	22 0.35 2	0.2	0.10	38	962 890	498
9S/ 3W-18P 1 S 4- 2-54	--	8.3	900	84 4.19 41	28 2.30 23	81 3.52 35	4 0.10 1	--	159 2.61 26	262 5.45 54	71 2.00 20	5.5 0.09 1	0.4	0.12	--	650 614	325

State well number Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C Evap 105°C Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				

SANTA MARGARITA HYDRO UNIT 20200

YSIDORA HYDRO SUBUNIT 202A0

9S/ 3W-19D 1 S 7-25-62	70	7.8	1350	84 4.19 32	64 5.26 40	85 3.70 28	3 0.08 1	0	164 2.69 20	146 3.04 23	241 6.80 51	55 0.89 7	0.2	0.12	38	868 797	473
9S/ 3W-19M 1 S 8-25-54	--	7.2	947	60 2.99 30	47 3.87 39	67 2.91 30	3 0.08 1	--	168 2.75 28	107 2.23 23	170 4.79 49	3.0 0.05 1	0.3	0.07	--	 665 540	343
9S/ 4W-24R 1 S 7-25-62	--	8.0	1280	76 3.79 28	67 5.51 41	93 4.04 30	3 0.08 1	0	236 3.87 28	225 4.68 34	156 4.40 32	39 0.63 5	0.2	0.15	43	846 818	465
9S/ 4W-25E 2 S 7-25-62	68	7.4	2110	134 6.69 30	103 8.47 37	170 7.39 33	2 0.05	0	206 3.38 15	413 8.60 38	367 10.35 45	31 0.50 2	0.4	0.23	38	1442 1360	759
9S/ 4W-25E 3 S 8-24-54	--	8.0	615	45 2.25 36	12 0.99 16	66 2.87 46	4 0.10 2	--	180 2.95 45	7 0.15 2	87 2.45 37	63.5 1.02 16	0.8	--	--	 395 374	162
9S/ 4W-25E 5 S 8- 6-62	--	6.9	1698	112 5.59 32	57 4.69 27	162 7.04 41	2 0.05	0	82 1.34 8	335 6.97 41	223 6.29 37	158 2.55 15	0.5	0.03	50	1147 1140	514
10S/ 4W- 5D 1 S 1-25-52	--	7.8	990	62 3.09 31	22 1.81 18	120 5.22 52	--	--	263 4.31 46	93 1.94 21	110 3.10 33	0.1	0.4	0.05	24	 694 561	245
10S/ 4W- 7H 1 S 6-12-51	--	7.7	--	52 2.59	30 2.47	--	--	--	--	66 1.37	124 3.50	--	--	--	15	 720	253
10S/ 4W- 7R 1 S 1-10-52	--	7.5	1100	62 3.09 27	26 2.14 19	141 6.13 54	--	--	285 4.67 44	112 2.33 22	126 3.55 34	0.1	0.5	0.18	24	 776 632	262
10S/ 4W-18E 1 S 1-10-52	--	8.1	1030	62 3.09 30	20 1.64 16	126 5.48 54	--	--	264 4.33 43	109 2.27 23	122 3.44 34	0.0	0.4	0.30	24	 727 594	237
10S/ 4W-18M 1 S 11-29-51	--	7.8	--	64 3.19	76 6.25	--	--	--	--	--	56 1.58	124 2.00	--	--	6	 390	472
10S/ 4W-18M 2 S 1-25-52	--	7.8	1150	62 3.09 27	19 1.56 13	161 7.00 60	--	0	286 4.69 43	130 2.71 25	124 3.50 32	0.1	0.5	0.40	24	 806 662	233
10S/ 5W-13G 1 S 8-24-51	72	7.5	--	120 5.99	46 3.78	--	--	--	--	37 0.77	120 3.38	--	--	--	30	 351	489
10S/ 5W-13J 1 S 7- 6-51	--	7.6	--	124 6.19	79 6.50	--	--	--	--	98 2.04	120 3.38	--	--	--	15	 598	635
10S/ 5W-13R 1 S 3- 1-49	--	8.1	--	35 1.75	23 1.89	--	--	3 0.10	238 3.90	63 1.31	120 3.38	--	--	--	20	 638	182
10S/ 5W-14P 1 S 1-11-52	--	7.4	1270	83 4.14 30	24 1.97 14	172 7.48 55	--	0	268 4.39 34	69 1.44 11	250 7.05 55	1.2 0.02	0.5	0.14	24	 890 756	306
10S/ 5W-23J 1 S 1-25-52	--	7.9	1060	58 2.89 26	23 1.89 17	144 6.26 57	--	0	295 4.84 46	98 2.04 19	128 3.61 34	0.3	0.1	0.15	18	 746 615	239
10S/ 5W-23J 2 S 9- 1-50	--	7.6	--	142 7.09	83 6.83	--	--	--	--	105 2.19	138 3.89	--	--	--	10	 612	697
10S/ 5W-23J 3 S 6-22-51	67	7.8	--	128 6.39	85 6.99	--	--	--	--	82 1.71	116 3.27	--	--	--	15	 564	670
10S/ 5W-23L 1 S 1-22-52	--	8.1	1470	87 4.34 27	31 2.55 16	212 9.22 57	--	0	308 5.05 33	112 2.33 15	280 7.90 52	0.2	0.4	0.15	24	 1030 898	345
10S/ 5W-23Q 1 S 1-11-52	--	8.1	2220	31 1.55 7	4 0.33 2	444 19.31 91	2 0.05	--	140 2.29 11	90 1.87 9	600 16.92 80	1.0 0.02	0.5	0.43	7	 1249	94
10S/ 5W-24H 1 S 8-21-50	--	7.4	--	135 6.74	75 6.17	--	--	--	--	51 1.06	126 3.55	--	--	--	20	 785	646

State well number	Temp. when	pH	Specific conductance	Chemical constituents in parts per million, equivalents per million, percent reactance value									Chemical constituents in parts per million				
Date sampled	sampled in °F		(micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
SANTA MARGARITA HYDRO UNIT 20200																	
YSIDORA HYDRO SUBUNIT 202A0																	
10S/ 5W-24H 3 S	--	--	--	49	17	122	--	--	259	60	131	--	--	--	13		193
12-18-26				2.45	1.40	5.30			4.25	1.25	3.69					651	
10S/ 5W-26L 1 S	72	--	919	--	--	--	--	--	--	--	169	--	--	0.22	--		61
5-11-55											4.77						
10S/ 5W-35J 1 S	--	--	--	134	54	479	--	--	424	198	745	--	--	--	32		557
11- 9-26				6.69	4.44	20.83			6.95	4.12	21.01					2066	
10S/ 5W-35K 1 S	68	7.3	1250	78	31	149	5	0	350	112	163	0.0	--	0.09	35	770	322
11- 4-57				3.89	2.55	6.48	0.13		5.74	2.33	4.60						
				30	20	50	1		45	18	36					745	
10S/ 5W-35K 5 S	72	--	828	--	--	--	--	--	--	--	136	--	--	0.25	--		98
5-11-55											3.84						
11S/ 5W- 1E 1 S	70	7.7	2080	118	57	250	6	0	335	156	430	0.6	--	0.49	30	1230	529
11- 1-57				5.89	4.69	10.87	0.15		5.49	3.25	12.13	0.01					
				27	22	50	1		26	16	58					1213	
11S/ 5W- 2A 1 S	69	7.3	1400	84	39	171	5	0	340	134	220	0.4	--	0.40	27	884	370
11- 1-57				4.19	3.21	7.44	0.13		5.57	2.79	6.20	0.01					
				28	21	50	1		38	19	43					848	
11S/ 5W- 2D 3 S	66	7.3	1940	184	83	136	4	0	410	475	185	0.0	--	0.04	32	1370	801
11- 4-57				9.18	6.83	5.91	0.10		6.72	9.89	5.22						
				42	31	27			31	45	24					1301	
11S/ 5W- 2E 1 S	67	7.5	1410	88	33	166	6	0	335	144	213	2.1	--	0.22	27	854	355
11- 1-57				4.39	2.71	7.22	0.15		5.49	3.00	6.01	0.03					
				30	19	50	1		38	21	41					844	
11S/ 5W- 2E 3 S	--	--	--	56	22	142	--	--	275	104	145	--	--	--	26		230
12-18-26				2.79	1.81	6.17			4.51	2.17	4.09					770	
11S/ 5W- 2F 1 S	69	7.4	1320	80	34	161	6	0	325	108	215	0.2	--	0.49	33	812	340
11- 4-57				3.99	2.80	7.00	0.15		5.33	2.25	6.06						
				29	20	50	1		39	16	44					797	
11S/ 5W- 2K 1 S	70	7.2	2890	120	73	382	8	0	330	178	682	0.0	--	0.39	37	1710	600
11- 4-57				5.99	6.00	16.61	0.20		5.41	3.71	19.23						
				21	21	58	1		19	13	68					1643	
11S/ 5W- 2K 2 S	75	7.7	1290	16	10	267	5	0	465	60	152	0.3	--	0.61	18	778	81
11- 4-57				0.80	0.82	11.61	0.13		7.62	1.25	4.29						
				6	6	87	1		58	9	33					758	
11S/ 5W- 2N 2 S	--	--	--	30	9	54	--	--	143	27	60	--	--	--	14		112
12-18-26				1.50	0.74	2.35			2.34	0.56	1.69					337	
11S/ 5W- 2N 3 S	--	--	--	34	25	191	--	--	244	85	224	--	--	--	15		188
12-18-26				1.70	2.06	8.30			4.00	1.77	6.32					818	
11S/ 5W- 2N 4 S	70	7.2	2000	95	58	254	7	0	315	152	430	0.5	--	0.31	29	1260	476
10-31-57				4.74	4.77	11.04	0.18		5.16	3.16	12.13	0.01					
				23	23	53	1		25	15	59					1181	
11S/ 5W- 2P 1 S	70	8.0	--	190	230	--	--	--	--	70	392	--	--	--	15		1421
8-23-51				9.48	18.92					1.46	11.05					860	
11S/ 5W- 9J 1 S	70	7.3	33800	422	1020	6150	108	0	162	1100	12200	4.8	--	2.10	11	23000	5251
11- 1-57				21.06	83.88	267.40	2.76		2.66	22.90	344.04	0.08					
				6	22	71	1		1	6	93					21098	
11S/ 5W-19B 1 S	70	7.3	3280	179	79	394	11	0	265	146	900	1.1	--	0.28	36	2020	772
10-30-57				8.93	6.50	17.13	0.28		4.34	3.04	25.38	0.02					
				27	20	52	1		13	9	77					1877	
DE LUZ HYDRO SUBUNIT 20280																	
8S/ 3W- 7D 3 S	85	7.5	1140	74	52	82	4	0	189	226	142	0	0.4	0.05	--	820	399
6-23-64				3.69	4.28	3.57	0.10		3.10	4.71	4.00						
				32	37	31	1		26	40	34					673	
8S/ 3W-32M 1 S	--	8.0	533	30	22	47	4	0	192	11	69	0.6	0.1	0.06	9		166
7- 5-60				1.50	1.81	2.04	0.10		3.15	0.23	1.95	0.01				267	
				28	33	37	2		59	4	37					287	
8S/ 3W-32M 2 S	--	8.4	680	73	18	39	2	11	272	19	51	1.9	0.2	0.02	59	425	256
7- 5-60				3.64	1.48	1.70	0.05	0.37	4.46	0.40	1.44	0.03					
				53	22	25	1	6	67	6	21					408	

SANTA MARGARITA HYDRO UNIT 20200

DE LUZ HYDRO SUBUNIT 20280

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
8S/ 3W-32N 1 S	68	8.1	830	70	39	64	3	0	250	141	99	2.6	0.4	0.03	52	601	335
6-22-60				3.49	3.21	2.78	0.08		4.10	2.94	2.79	0.04					
				37	34	29	1		42	30	28					594	
8S/ 3W-32N 2 S	--	7.8	600	42	23	43	5	0	221	23	70	0.0	0.2	0.70	11	398	200
4-17-57				2.10	1.89	1.87	0.13		3.62	0.48	1.97						
				35	32	31	2		60	8	32					327	
8S/ 3W-32N 3 S	68	7.6	568	72	21	39	3	--	262	34	53	2.5	0.2	0.04	--		266
4-20-54				3.59	1.73	1.70	0.08		4.29	0.71	1.49	0.04				415	
				51	24	24	1		66	11	23	1				354	
8S/ 3W-33K 1 S	60	7.2	550	51	17	55	2	0	228	34	76	0	0.1	0	17	418	197
3- 6-63				2.54	1.40	2.39	0.05		3.74	0.71	2.14						
				40	22	37	1		57	11	32					364	
8S/ 4W-29J 1 S	--	7.6	578	45	18	50	1	0	201	33	64	7.4	0.5	0.03	42	315	187
8- 6-62				2.25	1.48	2.17	0.03		3.29	0.69	1.80	0.12					
				38	25	37	1		56	12	31	2				360	
8S/ 4W-32B 2 S	--	7.4	445	34	9	52	1	--	168	24	46	4.6	0.5	0.08	--		122
7-27-54				1.70	0.74	2.26	0.03		2.75	0.50	1.30	0.07				314	
				36	16	48	1		60	11	28	2				254	
8S/ 4W-34F 1 S	--	7.2	288	23	4	32	1	--	70	23	32	34.3	0.1	0.15	--		74
8-25-54				1.15	0.33	1.39	0.03		1.15	0.48	0.90	0.55				270	
				40	11	48	1		37	16	29	18				184	
9S/ 3W- 1P 3 S	--	7.7	952	58	35	80	4	--	104	35	199	35	0.6	0	--		289
11-10-53				2.89	2.88	3.48	0.10		1.70	0.73	5.61	0.56				647	
				31	31	37	1		20	8	65	7				498	
9S/ 3W- 1P 5 S	--	7.5	458	24	12	53	1	--	110	28	71	11	0.4	0.09	--		110
11-10-53				1.20	0.99	2.30	0.03		1.80	0.58	2.00	0.18				332	
				27	22	51	1		39	13	44	4				254	
9S/ 3W- 1Q 1 S	64	7.8	1110	69	41	98	4	0	187	70	188	95	0.4	0.07	--	672	341
6-12-64				3.44	3.37	4.26	0.10		3.06	1.46	5.30	1.53					
				31	30	38	1		27	13	47	13				657	
9S/ 3W- 1Q 2 S	--	7.5	1116	80	50	131	4	--	116	72	330	48.3	0.7	0.07	--		405
4-20-54				3.99	4.11	5.70	0.10		1.90	1.50	9.31	0.78				897	
				29	30	41	1		14	11	69	6				773	
9S/ 3W-12F 3 S	--	8.6	793	46	28	83	4	--	171	42	149	16	0.9	0.05	--		230
11- 9-53				2.30	2.30	3.61	0.10		2.80	0.87	4.20	0.26				525	
				28	28	43	1		34	11	52	3				453	
9S/ 3W-12M 1 S	68	8.0	620	33	21	71	1	0	159	68	75	14	0.6	0.07	--	384	169
6-12-64				1.65	1.73	3.09	0.03		2.61	1.42	2.12	0.23					
				25	27	48			41	22	33	4				362	
9S/ 3W-17C 1 S	72	7.4	1290	83	56	93	4	0	229	167	207	0	0.1	0.08	34	896	438
7-25-62				4.14	4.61	4.04	0.10		3.75	3.48	5.84						
				32	36	31	1		29	27	45					757	
9S/ 4W- 5Q 1 S	73	7.7	560	37	13	60	2	0	199	22	66	0	0.6	0.08	34	316	146
7-25-62				1.85	1.07	2.61	0.05		3.26	0.46	1.86						
				33	19	47	1		58	8	33					332	
9S/ 4W- 5Q 2 S	--	7.3	425	52	7	30	3	--	195	9	35	3.9	0.1	0.08	--		159
8-25-54				2.59	0.58	1.30	0.08		3.20	0.19	0.99	0.06				275	
				57	13	29	2		72	4	22	1				236	
9S/ 4W-13P 1 S	--	7.8	1026	74	36	65	3	--	134	67	135	128	0.2	0.04	--		333
4- 2-54				3.69	2.96	2.83	0.08		2.20	1.39	3.81	2.06				730	
				39	31	30	1		23	15	40	22				574	
9S/ 4W-13Q 1 S	--	6.8	1500	102	65	129	2	--	134	250	261	67.2	0.5	0.22	--		522
8-25-54				5.09	5.35	5.61	0.05		2.20	5.21	7.36	1.08				1067	
				32	33	35			14	33	46	7				943	
9S/ 4W-29C 1 S	--	7.9	--	34	16	--	--	--	--	21	50	--	--	--	24		151
11-29-51				1.70	1.32					0.44	1.41					220	
9S/ 4W-29C 2 S	--	7.6	--	41	11	--	--	--	--	4	76	--	--	--	8		148
11-29-51				2.05	0.90					0.08	2.14					230	
9S/ 4W-29L 1 S	--	7.7	480	31	12	49	--	--	164	23	53	3.3	--	0.06	--		127
6- 9-53				1.55	0.99	2.13			2.69	0.48	1.49	0.05				250	
				33	21	46			57	10	32	1				252	

MURRIETA HYDRO SUBUNIT 202C0

State well number / Date sampled	Temp.	pH	Spec. cond.	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F	B	SiO_2	TDS	Total hardness
5S/ 1W-32Q 1 S	64	7.4	2600	317	41	330	3	0	390	884	303	22	0.2	0.20	47	2282	960
3-20-63				15.82	3.37	14.35	0.08		6.39	18.40	8.54	0.35					
				47	10	43			19	55	25	1				2139	

State well number Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				

SANTA MARGARITA HYDRO UNIT 20200

MURRIETA HYDRO SUBUNIT 202C0

State well number Date sampled	Temp.	pH	Sp. cond.	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F	B	SiO_2	TDS	Total hardness
5S/ 2W-34P 1 S 5-12-53	--	7.2	1080	89 4.44 42	33 2.71 25	81 3.52 33	--	--	153 2.51 24	47 0.98 9	227 6.40 61	36.8 0.59 6	--	0.06	--	 589	358
6S/ 1W- 4J 1 S 10- 1-63	80	7.6	605	50 2.50 44	7 0.58 10	58 2.52 45	2 0.05 1	0	183 3.00 51	55 1.15 20	53 1.49 25	13 0.21 4	0.3	0	--	421 328	154
6S/ 1W- 5G 1 S 8-21-62	--	7.5	720	57 2.84 36	18 1.48 19	79 3.43 44	4 0.10 1	0	233 3.82 48	78 1.62 21	83 2.34 30	7.0 0.11 1	0.4	0.10	28	446 469	216
6S/ 2W- 1A 1 S 4- 7-53	--	8.1	820	52 2.59 31	29 2.38 29	76 3.30 40	--	0	153 2.51 31	140 2.91 36	89 2.51 31	10.2 0.16 2	--	0.07	--	 471	249
6S/ 2W- 2G 1 S 3-20-63	--	6.7	1900	162 8.08 35	68 5.59 25	205 8.91 39	8 0.20 1	0	409 6.70 30	422 8.79 39	252 7.11 31	6.0 0.10	0.2	0.17	56	1410 1380	684
6S/ 2W- 2J 1 S 1- 8-63	--	7.1	875	78 3.89 44	22 1.81 20	71 3.09 35	4 0.10 1	0	232 3.80 44	120 2.50 29	74 2.09 24	14 0.23 3	0.2	0.09	37	576 534	285
6S/ 2W- 2N 1 S 3-20-63	--	7.7	940	80 3.99 40	28 2.30 23	80 3.48 35	4 0.10 1	0	201 3.29 33	175 3.64 37	101 2.85 29	11 0.18 2	0.1	0.13	38	654 616	315
6S/ 2W- 2P 1 S 12-22-60	70	7.1	931	85 4.24 44	24 1.97 21	74 3.22 34	5 0.13 1	0	228 3.74 39	141 2.94 31	98 2.76 29	10.6 0.17 2	0.4	0.05	48	638 598	311
6S/ 2W- 3R 2 S 5- 2-63	--	7.4	1330	126 6.29 44	31 2.55 18	120 5.22 37	5 0.13 1	0	305 5.00 35	178 3.71 26	184 5.19 37	13 0.21 1	0.4	0.03	39	879 846	442
6S/ 2W- 9A 1 S 3-20-63	66	7.1	1500	190 9.48 54	31 2.55 15	125 5.44 31	4 0.10 1	0	357 5.85 33	354 7.37 41	162 4.57 25	8.6 0.14 1	0.2	0.14	40	1116 1090	602
6S/ 2W- 9R 1 S 11- 8-62	--	7.1	1240	93 4.64 36	29 2.38 19	130 5.65 44	3 0.08 1	0	241 3.95 31	196 4.08 32	151 4.26 34	17 0.27 2	0.2	0.09	42	836 780	351
6S/ 2W-10D 2 S 5- 2-62	--	7.0	1080	94 4.69 41	28 2.30 20	103 4.48 39	3 0.08 1	0	275 4.51 39	158 3.29 29	119 3.36 29	20 0.32 3	0.3	0.12	38	754 699	350
6S/ 2W-10E 1 S 11-28-56	59	7.6	3815	290 14.47 29	145 11.92 23	552 24.00 47	15 0.38 1	0	312 5.11 10	1753 36.50 72	322 9.08 18	6 0.10	0.6	0.48	68	3404 3305	1321
6S/ 2W-11A 1 S 11- 5-52	--	7.7	770	69 3.44	25 2.06	38 1.65	--	--	--	147 3.06	33 0.93	10.3 0.17	--	0.06	--		275
6S/ 2W-15D 1 S 3-20-63	62	7.8	680	49 2.45 33	19 1.56 21	76 3.30 45	2 0.05 1	0	268 4.39 59	33 0.69 9	64 1.80 24	32 0.52 7	0.1	0.14	37	474 444	201
6S/ 2W-17N 1 S 5-19-53	--	8.3	13050	248 12.38	349 28.70	2485 108.05	--	--	--	2822 58.75	2730 76.99	--	--	0.27	--		2056
6S/ 2W-20A 1 S 3-20-63	--	8.2	1900	162 8.08 42	84 6.91 36	98 4.26 22	6 0.15 1	0	268 4.39 23	123 2.56 13	428 12.07 62	30 0.48 2	0.1	0.15	25	1216 1088	750
6S/ 2W-22D 1 S 11- 8-62	--	7.4	535	43 2.15 41	7 0.58 11	57 2.48 47	1 0.03 1	0	205 3.36 63	29 0.60 11	36 1.02 19	23 0.37 7	0.4	0.09	34	330 331	137
6S/ 2W-27N 1 S 5-14-53	--	7.7	690	71 3.54 48	22 1.81 25	45 1.96 27	--	0	214 3.51 49	58 1.21 17	78 2.20 31	12.2 0.20 3	--	0.05	--	 391	268
6S/ 2W-28G 2 S 5-15-53	--	7.6	1090	93 4.64 41	27 2.22 20	103 4.48 40	--	0	165 2.70 24	222 4.62 41	135 3.81 34	6.6 0.11 1	--	0.12	--	 668	343
6S/ 2W-28G 3 S 5- 2-63	67	7.6	967	84 4.19 42	19 1.56 15	98 4.26 42	3 0.08 1	0	186 3.05 31	171 3.56 36	115 3.24 32	8.0 0.13 1	0.6	0.05	38	650 628	288
6S/ 2W-28J 1 S 11- 7-62	--	7.7	1240	103 5.14 39	30 2.47 19	125 5.44 42	2 0.05	0	341 5.59 43	160 3.33 26	131 3.69 29	17 0.27 2	0.2	0.12	34	806 770	381
6S/ 2W-29R 1 S 4- 7-53	--	8.2	790	42 2.10 25	23 1.89 23	99 4.30 52	--	0	238 3.90 50	53 1.10 14	92 2.59 33	14.5 0.23 3	--	0.07	--	 441	200

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C Evap 105°C Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
SANTA MARGARITA HYDRO UNIT Z0200																	
MURRIETA HYDRO SUBUNIT Z02C0																	
6S/ 2W-30A 1 S	--	7.0	480	43	12	41	2	0	149	9	71	14	0.2	0.05	31	350	157
11- 7-62				2.15	0.99	1.78	0.05		2.44	0.19	2.00	0.23					
				43	20	36	1		50	4	41	5				296	
6S/ 2W-30C 1 S	--	7.8	500	28	18	50	--	0	153	15	53	29	--	0.01	--		144
5-22-53				1.40	1.48	2.17			2.51	0.31	1.49	0.47					
				28	29	43			53	6	31	10				268	
6S/ 2W-31L 1 S	--	7.9	960	78	34	66	--	0	287	30	124	18.5	--	0	--		335
5-19-53				3.89	2.80	2.87			4.70	0.62	3.50	0.30					
				41	29	30			52	7	38	3				492	
6S/ 2W-32A 1 S	--	7.9	1150	102	31	124	3	0	235	218	149	12.0	0.4	0.04	--		382
1- 7-54				5.09	2.55	5.39	0.08		3.85	4.54	4.20	0.19					
				39	19	41	1		30	36	33	1				755	
6S/ 2W-32H 1 S	--	7.7	730	62	23	57	--	0	171	91	89	13.7	--	0.04	--		249
5-15-53				3.09	1.89	2.48			2.80	1.89	2.51	0.22					
				41	25	33			38	25	34	3				420	
6S/ 3W-31P 1 S	--	7.7	610	34	25	75	--	--	177	116	71	36.8	--	0	--		188
8-19-52				1.70	2.06	3.26			2.90	2.42	2.00	0.59					
				24	29	46			37	31	25	7				445	
6S/ 3W-31R 1 S	--	7.7	730	51	30	70	--	--	232	29	117	2.0	--	0.07	--		251
8-17-52				2.54	2.47	3.04			3.80	0.60	3.30	0.03					
				32	31	38			49	8	43					413	
6S/ 3W-34J 1 S	--	7.3	990	67	30	98	1	0	312	66	84	71	0.4	0.38	34	598	291
1-10-63				3.34	2.47	4.26	0.03		5.11	1.37	2.37	1.15					
				33	24	42			51	14	24	12				605	
6S/ 4W-26Q 1 S	--	8.4	350	5	1	82	--	--	98	24	50	1.4	--	0.10	--		17
10-24-52				0.25	0.08	3.57			1.61	0.50	1.41	0.02					
				6	2	92			45	14	40	1				212	
6S/ 4W-34J 2 S	--	7.4	850	80	22	75	4	0	126	235	74	0	0.6	0.17	6	626	290
5- 2-62				3.99	1.81	3.26	0.10		2.07	4.89	2.09						
				44	20	36	1		23	54	23					559	
6S/ 4W-34J 6 S	--	7.6	620	55	18	53	--	--	244	9	53	27.6	--	0.05	--		211
4-28-53				2.74	1.48	2.30			4.00	0.19	1.49	0.45				338	
				42	23	35			65	3	24	7				336	
6S/ 4W-34J 9 S	--	8.3	480	30	14	53	--	--	189	8	43	8.2	--	0.06	--		133
4-28-53				1.50	1.15	2.30			3.10	0.17	1.21	0.13					
				30	23	46			67	4	26	3				249	
6S/ 4W-34L 1 S	--	8.0	620	38	23	58	--	--	232	23	67	9.5	--	0.06	--		190
4-27-53				1.90	1.89	2.52			3.80	0.48	1.89	0.15					
				30	30	40			60	8	30	2				333	
6S/ 4W-34M 1 S	--	8.2	580	32	18	65	--	--	207	16	67	17.5	--	0.04	--		154
4-28-53				1.60	1.48	2.83			3.39	0.33	1.89	0.28					
				27	25	48			58	6	32	5				317	
6S/ 4W-34Q 2 S	--	7.8	470	30	20	38	--	--	171	13	25	32.7	--	0.12	--		157
4-27-53				1.50	1.64	1.65			2.80	0.27	0.71	0.53					
				31	34	34			65	6	16	12				243	
6S/ 4W-34Q 7 S	--	7.3	510	39	17	42	1	0	177	25	36	40	0.2	0.07	34	352	168
1- 9-63				1.95	1.40	1.83	0.03		2.90	0.52	1.02	0.65					
				37	27	35	1		57	10	20	13				321	
6S/ 4W-34R 1 S	--	8.4	600	40	26	49	--	--	238	20	43	47.5	--	0.07	--		207
4-27-53				2.00	2.14	2.13			3.90	0.42	1.21	0.77					
				32	34	34			62	7	19	12				343	
6S/ 4W-34R 3 S	--	7.8	660	48	26	53	--	--	226	20	60	39.3	--	0.02	--		227
4-27-53				2.40	2.14	2.30			3.70	0.42	1.69	0.63					
				35	31	34			57	7	26	10				357	
6S/ 4W-35D 1 S	72	7.5	611	50	16	50	1	0	146	22	108	17	0.2	0.02	30	378	191
5- 3-63				2.50	1.32	2.17	0.03		2.39	0.46	3.05	0.27					
				42	22	36			39	7	49	4				366	
6S/ 4W-35F 1 S	--	8.3	940	66	27	90	--	--	232	51	149	13.3	--	0.01	--		276
4-22-53				3.29	2.22	3.91			3.80	1.06	4.20	0.21					
				35	24	42			41	11	45	2				510	
6S/ 4W-35M 2 S	--	8.3	540	44	25	58	--	--	238	34	53	18	--	0.10	--		213
10-29-52				2.20	2.06	2.52			3.90	0.71	1.49	0.29					
				32	30	37			61	11	23	5				349	
6S/ 4W-35N 1 S	--	8.3	510	28	16	56	--	--	183	14	57	4.0	--	0.03	--		136
4-30-53				1.40	1.32	2.43			3.00	0.29	1.61	0.06					
				27	26	47			60	6	32	1				265	
6S/ 4W-35Q 1 S	--	8.4	690	52	19	69	--	--	201	42	92	15	--	0.03	--		208
2-20-53				2.59	1.56	3.00			3.29	0.87	2.59	0.24					
				36	22	42			47	12	37	3				388	

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million, equivalents per million, percent reactance value									Chemical constituents in parts per million				
SANTA MARGARITA HYDRO UNIT 20200																	
MURRIETA HYDRO SUBUNIT 202C0																	
6S/ 4W-360 1 S	--	7.6	560	34	18	53	--	--	146	15	62	44.9	--	0.10	--		159
4-22-53				1.70	1.48	2.30			2.39	0.31	2.31	0.72					
				31	27	42			42	5	40	13				319	
7S/ 2W- 40 1 S	--	8.0	1240	96	33	101	--	--	262	92	192	15	--	0.05	--		375
5-19-53				4.79	2.71	4.39			4.29	1.92	5.41	0.24					
				40	23	37			36	16	46	2				658	
7S/ 2W- 5C 1 S	--	7.3	1300	107	32	120	1	0	233	218	164	9	0.2	0.14	34	856	399
12- 7-62				5.34	2.63	5.22	0.03		3.82	4.54	4.62	0.15					
				40	20	39			29	35	35	1				800	
7S/ 2W-33E 1 S	--	7.6	400	30	11	41	1	0	146	12	39	25	0.2	0.05	38	274	120
12-21-62				1.50	0.90	1.78	0.03		2.39	0.25	1.10	0.40					
				36	21	42	1		58	6	27	10				269	
7S/ 3W- 2G 1 S	--	7.9	380	29	10	37	--	--	153	25	35	4	--	0.10	--		114
8-19-52				1.45	0.82	1.61			2.51	0.52	0.99	0.06					
				37	21	41			62	13	24	1				215	
7S/ 3W- 5L 1 S	--	7.6	1250	85	36	139	--	--	281	145	206	2	--	0.40	--		360
7-30-52				4.24	2.96	6.04			4.61	3.02	5.81	0.03					
				32	22	46			34	22	43					752	
7S/ 3W- 7R 2 S	--	7.9	754	23	1	129	2	0	122	42	144	9.3	0.6	0.07	18		62
9-12-61				1.15	0.08	5.61	0.05		2.00	0.87	4.06	0.15				417	
				17	1	81	1		28	12	57	2				429	
7S/ 3W- 7R 3 S	--	7.8	700	52	16	75	1	0	235	41	84	0	0.2	0.12	25	402	196
1-10-63				2.59	1.32	3.26	0.03		3.85	0.85	2.37						
				36	18	45			54	12	34					410	
7S/ 3W-12J 1 S	--	7.7	470	36	18	37	--	--	134	13	39	54	--	0.05	--		164
5-25-53				1.80	1.48	1.61			2.20	0.27	1.10	0.87					
				37	30	33			50	6	25	20				263	
7S/ 3W-15N 1 S	--	7.4	565	41	11	57	2	0	204	20	66	0	0.2	0	52	316	148
11-27-56				2.05	0.90	2.48	0.05		3.34	0.42	1.86						
				37	16	45	1		59	7	33					350	
7S/ 3W-16N 2 S	--	8.6	960	101	31	69	--	--	329	20	112	58	--	0.05	--		380
5-12-53				5.04	2.55	3.00			5.39	0.42	3.16	0.94					
				48	24	28			54	4	32	9				553	
7S/ 3W-16N 3 S	--	7.6	870	89	24	62	--	--	293	29	99	55	--	0.07	--		321
8-15-52				4.44	1.97	2.70			4.80	0.60	2.79	0.89					
				49	22	30			53	7	31	10				502	
7S/ 3W-16N 5 S	--	8.5	770	76	29	--	--	--	275	27	106	23	--	0.08	--		309
5-20-53				3.79	2.38				4.51	0.56	2.99	0.37					
7S/ 3W-170 1 S	--	8.5	630	26	8	106	--	--	177	38	96	2.0	--	0.27	--		98
7-22-52				1.30	0.66	4.61			2.90	0.79	2.71	0.03					
				20	10	70			45	12	42					363	
7S/ 3W-17E 3 S	--	7.7	610	55	21	--	--	--	256	21	60	23	--	0.14	--		224
7-22-53				2.74	1.73				4.20	0.44	1.69	0.37					
7S/ 3W-17E 4 S	--	7.5	770	66	24	56	1	0	262	35	93	3	0.1	0.05	--	446	263
7-15-64				3.29	1.97	2.43	0.03		4.29	0.73	2.62	0.05					
				43	26	31			56	9	34	1				407	
7S/ 3W-17F 3 S	--	7.3	538	25	10	70	7	--	128	40	71	19	0.5	0.01	--		104
10-14-53				1.25	0.82	3.04	0.18		2.10	0.83	2.00	0.31					
				24	16	57	3		40	16	36	6				305	
7S/ 3W-17G 1 S	--	7.9	510	18	4	91	--	--	165	16	74	6.9	--	0.03	--		62
5- 7-53				0.90	0.33	3.96			2.70	0.33	2.09	0.11					
				17	6	76			52	6	40	2				291	
7S/ 3W-17H 1 S	--	8.0	710	64	18	69	--	--	256	27	96	7.6	--	0.03	--		234
5- 7-53				3.19	1.48	3.00			4.20	0.56	2.71	0.12					
				42	19	39			55	7	36	2				407	
7S/ 3W-17H 2 S	--	7.9	762	69	16	62	0	0	232	36	105	9.4	0.2	0.02	30	455	238
11-22-57				3.44	1.32	2.70			3.80	0.75	2.96	0.15					
				46	18	36			50	10	39	2				442	
7S/ 3W-17P 2 S	--	8.0	950	80	28	84	1	0	299	40	137	12	0.1	0.05	--	558	315
7-15-64				3.99	2.30	3.65	0.03		4.90	0.83	3.86	0.19					
				40	23	37			50	8	39	2				529	
7S/ 3W-18A 1 S	--	8.0	530	44	17	50	--	--	214	16	53	21	--	0.05	--		180
5- 6-53				2.20	1.40	2.17			3.51	0.33	1.49	0.34					
				38	24	38			62	6	26	6				306	
7S/ 3W-18M 1 S	--	7.5	620	39	28	61	--	--	220	67	60	1.1	--	0.25	--		213
5- 6-53				1.95	2.30	2.65			3.61	1.39	1.69	0.02					
				28	33	38			54	21	25					364	

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				

SANTA MARGARITA HYDRO UNIT 20200

MURRIETA HYDRO SUBUNIT 202C0

State well number / Date sampled	Temp.	pH	Spec. cond.	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F	B	SiO_2	TDS	Total hardness
7S/ 3W-19A 1 S	--	8.2	700	52	21	58	--	--	226	36	78	7.0	--	0.10	--		216
7-17-52				2.59	1.73	2.52			3.70	0.75	2.20	0.11					
				38	25	37			55	11	33	2				363	
7S/ 3W-19A 2 S	--	8.5	510	44	18	36	--	--	189	20	46	12	--	0.09	--		184
7-17-52				2.20	1.48	1.57			3.10	0.42	1.30	0.19					
				42	28	30			62	8	26	4				269	
7S/ 3W-20A 3 S	--	7.5	866	83	25	66	1	0	298	36	103	29	0.3	0.10	50	520	310
5-21-59				4.14	2.06	2.87	0.03		4.88	0.75	2.90	0.47					
				45	23	32			54	8	32	5				540	
7S/ 3W-20A 4 S	--	7.9	779	70	24	63	1	0	273	41	89	16	0.4	0.10	40	480	273
5-21-59				3.49	1.97	2.74	0.03		4.47	0.85	2.51	0.26					
				42	24	33			55	11	31	3				479	
7S/ 3W-20A 9 S	--	7.9	846	80	27	65	1	0	312	35	97	27	0.4	0.10	40	505	311
5-21-59				3.99	2.22	2.83	0.03		5.11	0.73	2.74	0.44					
				44	24	31			57	8	30	5				526	
7S/ 3W-20A10 S	72	7.5	818	74	26	63	1	0	283	33	98	26	0.3	0.06	50	490	292
5-21-59				3.69	2.14	2.74	0.03		4.64	0.69	2.76	0.42					
				43	25	32			55	8	32	5				510	
7S/ 3W-20A14 S	--	7.7	768	58	24	70	2	0	259	37	91	23	0.4	0.22	30	465	243
5-21-59				2.89	1.97	3.04	0.05		4.25	0.77	2.57	0.37					
				36	25	38	1		53	10	32	5				463	
7S/ 3W-20B 3 S	--	8.0	866	82	27	66	1	0	315	33	103	26	0.3	0.06	40	520	316
5-21-59				4.09	2.22	2.87	0.03		5.16	0.69	2.90	0.42					
				44	24	31			56	8	32	5				533	
7S/ 3W-20C 4 S	--	8.2	1481	102	35	162	1	--	336	103	234	39	0.1	0	--		399
4- 9-54				5.09	2.88	7.04	0.03		5.51	2.14	6.60	0.63				880	
				34	19	47			37	14	44	4				841	
7S/ 3W-20D 1 S	--	7.9	1670	196	14	155	--	--	500	111	234	1.9	--	0.07	--		547
5-21-53				9.78	1.15	6.74			8.20	2.31	6.60	0.03					
				55	7	38			48	13	39					958	
7S/ 3W-20G 4 S	--	7.7	710	51	23	60	2	0	244	35	78	8.0	0.2	0.05	29	430	222
1-10-63				2.54	1.89	2.61	0.05		4.00	0.73	2.20	0.13					
				36	27	37	1		57	10	31	2				406	
7S/ 3W-20H 1 S	--	7.5	740	66	21	70	--	--	256	31	89	38	--	0.29	--		251
7-11-52				3.29	1.73	3.04			4.20	0.65	2.51	0.61					
				41	21	38			53	8	31	8				441	
7S/ 3W-21D 1 S	--	8.2	660	58	18	75	--	--	256	29	82	19	--	0.10	--		219
11- 5-52				2.89	1.48	3.26			4.20	0.60	2.31	0.31					
				38	19	43			57	8	31	4				407	
7S/ 3W-21D 2 S	--	7.5	688	67	16	52	1	0	232	17	83	14	0.4	0.03	41	416	233
5- 2-63				3.34	1.32	2.26	0.03		3.80	0.35	2.34	0.23					
				48	19	33			57	5	35	3				405	
7S/ 3W-21F 2 S	--	8.5	654	58	16	54	--	--	232	16	67	8.5	0.3	0.04	--		211
9- 2-53				2.89	1.32	2.35			3.80	0.33	1.89	0.14				374	
				44	20	36			62	5	31	2				334	
7S/ 3W-21M 3 S	--	8.3	740	62	20	58	1	0	241	33	92	16	0.1	0	33		237
11-22-57				3.09	1.64	2.52	0.03		3.95	0.69	2.59	0.26				452	
				42	23	35			53	9	35	3				434	
7S/ 3W-21P 1 S	--	7.9	750	68	26	94	--	--	268	83	114	3.7	--	0.11	--		277
11- 3-52				3.39	2.14	4.09			4.39	1.73	3.21	0.06					
				35	22	43			47	18	34	1				521	
7S/ 3W-21Q 1 S	--	7.9	560	56	11	61	--	--	201	22	64	12	--	0.11	--		185
7-11-52				2.79	0.90	2.65			3.29	0.46	1.80	0.19					
				44	14	42			57	8	31	3				325	
7S/ 3W-24D 3 S	--	7.7	440	28	1	69	1	0	128	17	65	5	0.4	0.20	--	240	74
7-16-64				1.40	0.08	3.00	0.03		2.10	0.35	1.83	0.08					
				31	2	67	1		48	8	42	2				250	
7S/ 3W-27H 2 S	--	8.1	1500	59	17	244	--	--	177	77	369	4.4	--	2.49	--		217
7-10-52				2.94	1.40	10.61			2.90	1.60	10.41	0.07					
				20	9	71			19	11	69					860	
7S/ 3W-27N 2 S	--	7.7	980	76	22	109	1	--	287	70	149	5.3	0.5	0.12	--		280
4-23-54				3.79	1.81	4.74	0.03		4.70	1.46	4.20	0.09				608	
				37	17	46			45	14	40	1				574	
7S/ 3W-27N 3 S	68	7.7	980	78	23	105	1	0	295	71	140	8.0	0.3	0.17	29	620	289
5- 1-62				3.89	1.89	4.57	0.03		4.84	1.48	3.95	0.13					
				37	18	44			47	14	38	1				600	
7S/ 3W-27P 1 S	--	7.3	1800	106	47	195	2	0	307	139	334	3.0	0.2	0.31	22	1106	458
1-10-63				5.29	3.87	8.48	0.05		5.03	2.89	9.42	0.05					
				30	22	48			29	17	54					999	

State well number Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C Evap 105°C Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
MURRIETA HYDRO SUBUNIT 202C0				SANTA MARGARITA HYDRO UNIT 20200													
7S/ 3W-28R 1 S 3- 7-60	71	7.2	595	51 2.54 42	12 0.99 16	56 2.43 40	2 0.05 1	0	211 3.46 57	13 0.27 4	80 2.26 37	6.8 0.11 2	0.2	0.18	49	362 374	177
7S/ 3W-29A 1 S 4-21-53	--	7.7	500	26 1.30 31	11 0.90 21	47 2.04 48	--	--	165 2.70 66	52 1.08 26	11 0.31 8	1.8 0.03 1	--	0.10	--	230	110
7S/ 3W-29J 1 S 4-21-53	--	7.5	630	36 1.80 31	19 1.56 27	58 2.52 43	--	--	183 3.00 49	62 1.29 21	64 1.80 29	2.1 0.03	--	0.01	--	331	168
7S/ 4W- 1A 1 S 9- 2-52	--	7.5	650	36 1.80 28	17 1.40 22	72 3.13 49	--	--	201 3.29 54	18 0.37 6	82 2.31 38	10 0.16 3	--	0.12	--	334	160
7S/ 4W- 1E 1 S 4-30-53	--	8.5	640	50 2.50 38	20 1.64 25	57 2.48 37	--	0	232 3.80 60	12 0.25 4	64 1.80 29	28 0.45 7	--	0.04	--	345	207
7S/ 4W- 1P 2 S 4-30-53	--	8.5	1640	132 6.59 37	50 4.11 23	160 6.96 39	--	--	366 6.00 35	179 3.73 22	256 7.22 42	17 0.27 2	--	--	--	974	535
7S/ 4W- 1Q 2 S 7- 4-52	--	7.8	630	44 2.20 33	17 1.40 21	71 3.09 46	--	0	226 3.70 60	21 0.44 7	57 1.61 26	23 0.37 6	--	0.12	--	344	180
7S/ 4W- 1Q 3 S 11-21-57	--	7.8	612	--	--	--	--	0	211 3.46	--	83 2.34	--	--	--	--		175
7S/ 4W- 1Q 5 S 5- 1-53	--	8.6	1430	80 3.99 28	32 2.63 18	178 7.74 54	--	--	305 5.00 35	74 1.54 11	263 7.42 53	9.7 0.16 1	--	0.13	--	787	331
7S/ 4W- 2B 2 S 7-15-64	--	8.0	745	49 2.45 31	16 1.32 17	93 4.04 52	1 0.03	0	222 3.64 47	52 1.08 14	103 2.90 37	9 0.15 2	0.2	0.05	--	446 432	189
7S/ 4W- 2G 2 S 5-15-52	--	7.5	583	42 2.10 38	18 1.48 27	44 1.91 35	--	0	151 2.47 49	35 0.73 14	62 1.75 34	8.1 0.13 3	0.5	0	--	341 284	179
7S/ 4W- 3A 3 S 4-30-53	--	8.3	670	54 2.69 39	26 2.14 31	47 2.04 30	--	--	262 4.29 62	20 0.42 6	71 2.00 29	10 0.16 2	--	0.01	--	357	242
7S/ 4W-11A 1 S 2-11-53	--	7.7	730	58 2.89 39	18 1.48 20	69 3.00 41	--	--	201 3.29 45	71 1.48 20	89 2.51 34	2.5 0.04 1	--	0.05	--	406	219
7S/ 4W-12D 1 S 1- 9-63	--	7.5	770	68 3.39 42	18 1.48 18	71 3.09 38	5 0.13 2	0	150 2.46 34	59 1.23 17	124 3.50 49	0	0.2	0.05	17	476 436	244
7S/ 4W-12G 1 S 4-30-53	--	8.6	700	50 2.50	25 2.06	--	--	--	238 3.90	55 1.15	75 2.12	6.7 0.11	--	0.01	--		228
7S/ 4W-12H 2 S 7-15-64	--	7.3	400	31 1.55 39	6 0.49 12	45 1.96 49	1 0.03 1	0	104 1.70 43	14 0.29 7	57 1.61 40	25 0.40 10	0.1	0.12	--	248 230	102
8S/ 2W- 7A 1 S 0- 0-39	--	--	340	3 0.15 5	1 0.08 3	67 2.91 93	--	18 0.60 19	52 0.85 28	10 0.21 7	50 1.41 46	1 0.02 1	--	--	--	202 176	12
8S/ 3W- 1P 2 S 5-19-53	--	7.7	410	14 0.70 18	7 0.58 15	59 2.57 67	--	--	122 2.00 49	7 0.15 4	60 1.69 41	15 0.24 6	--	0.03	--	222	64
8S/ 3W-12C 1 S 12-21-62	--	7.3	270	20 1.00 36	5 0.41 15	30 1.30 47	3 0.08 3	0	104 1.70 63	8 0.17 6	23 0.65 24	12 0.19 7	0.2	0.07	33	172 185	71
8S/ 3W-12N 5 S 5- 1-62	--	7.8	1020	55 2.74 26	18 1.48 14	143 6.22 59	1 0.03	0	227 3.72 35	97 2.02 19	169 4.77 45	0	0.4	0.24	17	618 612	211
8S/ 3W-12N13 S 11- 0-53	--	8.3	1500	74 3.69 22	32 2.63 16	242 10.52 62	1 0.03	--	433 7.10 44	109 2.27 14	238 6.71 41	15 0.24 1	0.4	0.41	--	984 925	316
8S/ 3W-12Q 2 S 1-11-53	--	8.3	500	36 1.80 31	18 1.48 25	60 2.61 44	--	--	177 2.90 55	3 0.06 1	71 2.00 38	19 0.31 6	--	0.01	--	294	164
8S/ 3W-13K 1 S 5- 6-53	--	8.1	410	11 0.55 15	6 0.49 13	62 2.70 72	--	--	116 1.90 49	12 0.25 6	50 1.41 36	21 0.34 9	--	0.11	--	219	52

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C Evap 105°C Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million, equivalents per million, percent reactance value									Chemical constituents in parts per million				
SANTA MARGARITA HYDRO UNIT 20200																	
AULD HYDRO SUBUNIT 20200																	
6S/ 1E-25J 1 S	64	7.0	870	73	33	78	5	0	220	195	57	45	0.8	0.09	33	618	318
12-12-62				3.64	2.71	3.39	0.13		3.61	4.06	1.61	0.73					
				37	27	34	1		36	41	16	7				628	
6S/ 1E-25R 2 S	57	7.9	960	93	35	74	5	0	214	77	15	0.4	--	0.04	24	666	376
12-12-62				4.64	2.88	3.22	0.13		3.51	1.60	0.42	0.01					
				43	26	30	1		63	29	8					429	
6S/ 1E-36L 1 S	--	7.3	530	45	12	47	2	0	217	17	48	0	0.4	0.09	22	292	162
12-12-62				2.25	0.99	2.04	0.05		3.56	0.35	1.35						
				42	19	38	1		68	7	26					300	
6S/ 1W-31N 1 S	--	8.4	1540	102	50	152	--	0	244	292	227	17.1	--	0.07	--		460
9-18-52				5.09	4.11	6.61			4.00	6.08	6.40	0.28					
				32	26	42			24	36	38	2				960	
7S/ 1E- 1R 1 S	--	7.1	550	53	14	50	5	0	201	39	60	28	0.2	0.04	22	374	190
12-12-62				2.64	1.15	2.17	0.13		3.29	0.81	1.69	0.45					
				43	19	36	2		53	13	27	7				370	
7S/ 1E- 4G 1 S	--	7.4	420	38	10	45	2	0	201	10	50	13	0.4	0.07	24	266	136
12-11-62				1.90	0.82	1.96	0.05		3.29	0.21	1.41	0.21					
				40	17	41	1		64	4	28	4				291	
7S/ 1E- 4P 1 S	--	7.7	450	38	9	51	2	0	205	0	42	9.0	0.4	0.09	22	242	132
12-11-62				1.90	0.74	2.22	0.05		3.36		1.18	0.15					
				39	15	45	1		72		25	3				274	
7S/ 1E- 6K 1 S	--	7.3	540	43	13	48	3	0	202	25	59	2.0	0.6	0.08	27	322	161
12-11-62				2.15	1.07	2.09	0.08		3.31	0.52	1.66	0.03					
				40	20	39	1		60	9	30	1				320	
7S/ 1E- 7B 2 S	--	7.8	1120	42	25	190	4	477	24	132	14	0.6	--	0.22	28	686	208
12-11-62				2.10	2.06	8.26	0.10	15.90	0.39	2.75	0.39	0.01					
				17	16	66	1	82	2	14	2					925	
7S/ 1E- 7E 4 S	--	7.3	680	58	15	63	3	0	261	24	67	7.0	0.2	0.11	27	414	206
12-11-62				2.89	1.23	2.74	0.08		4.28	0.50	1.89	0.11					
				42	18	39	1		63	7	28	2				393	
7S/ 1E- 8D 1 S	--	7.9	750	47	14	115	3	0	350	19	74	8.0	0.4	0.17	29	494	175
12-11-62				2.35	1.15	5.00	0.08		5.74	0.40	2.09	0.13					
				27	13	58	1		69	5	25	2				482	
7S/ 1W- 9P 1 S	--	8.2	830	44	22	103	3	0	284	68	78	15	0.5	0.06	34	489	201
12-21-62				2.20	1.81	4.48	0.08		4.65	1.42	2.20	0.24					
				26	21	52	1		55	17	26	3				507	
7S/ 1W-10R 1 S	--	8.5	1160	58	35	162	--	--	433	86	128	6.1	--	0.17	--		289
5-26-53				2.89	2.88	7.04			7.10	1.79	3.61	0.10					
				23	22	55			56	14	29	1				688	
7S/ 1W-12H 1 S	60	7.0	1120	87	41	105	6	0	342	189	131	0	0.6	0.11	29	734	386
12-13-62				4.34	3.37	4.57	0.15		5.61	3.93	3.69						
				35	27	37	1		42	30	28					757	
7S/ 1W-12K 1 S	62	7.1	985	79	23	90	5	0	236	134	122	0	0.2	0.22	27	612	292
12-13-62				3.94	1.89	3.91	0.13		3.87	2.79	3.44						
				40	19	40	1		38	28	34					596	
7S/ 1W-14A 1 S	--	7.9	755	66	19	98	4	0	324	29	67	24	0.6	0.13	47	488	243
12-13-62				3.29	1.56	4.26	0.10		5.31	0.60	1.89	0.39					
				36	17	46	1		65	7	23	5				514	
7S/ 1W-14J 1 S	--	7.5	835	62	21	98	3	0	301	29	103	26	0.2	0.58	33	500	241
12-13-62				3.09	1.73	4.26	0.08		4.93	0.60	2.90	0.42					
				34	19	47	1		56	7	33	5				524	
7S/ 1W-18J 1 S	--	7.7	670	37	23	74	--	--	201	25	92	21.1	--	0	--		187
5-26-53				1.85	1.89	3.22			3.29	0.52	2.59	0.34				372	
				27	27	46			49	8	38	5				371	
7S/ 1W-18D 2 S	--	8.2	780	46	19	96	6	0	265	49	94	2.5	0.7	0.06	44	476	193
5- 2-63				2.30	1.56	4.17	0.15		4.34	1.02	2.65	0.04					
				28	19	51	2		54	13	33					488	
7S/ 1W-30N 1 S	--	7.9	910	57	20	99	--	--	250	15	146	11.5	--	0.08	--		224
5-19-53				2.84	1.64	4.30			4.10	0.31	4.12	0.19					
				32	19	49			47	4	47	2				471	
7S/ 2W- 2M 1 S	--	8.4	686	65	26	42	1	0	222	50	75	8.0	0.3	0.02	52	465	269
12-21-62				3.24	2.14	1.83	0.03		3.64	1.04	2.12	0.13					
				45	30	25			53	15	31	2				428	
7S/ 2W- 2P 2 S	70	8.2	1440	98	38	143	1	0	339	131	209	11	0.4	0.07	--		401
11-28-56				4.89	3.13	6.22	0.03		5.56	2.73	5.89	0.18				876	
				34	22	44			39	19	41	1				798	
7S/ 2W- 4J 2 S	--	6.5	720	58	17	46	--	--	208	55	71	12.3	--	0.07	--		215
8-26-52				2.89	1.40	2.00			3.41	1.15	2.00	0.20					
				46	22	32			50	17	30	3				362	

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
SANTA MARGARITA HYDRO UNIT 20200																	
AULD HYDRO SUBUNIT 20200																	
7S/ 2W- 4K 1 S	--	7.5	1090	95	25	96	--	--	374	111	149	9.9	--	0.06	--		340
4- 7-53				4.74	2.06	4.17			6.13	2.31	4.20	0.16					
				43	19	38			48	18	33	1				670	
7S/ 2W- 8H 1 S	--	8.2	2660	160	91	306	--	--	360	423	482	11.3	--	0.14	--		774
4- 7-53				7.98	7.48	13.30			5.90	8.81	13.59	0.18					
				28	26	46			21	31	48	1				1650	
7S/ 2W- 8M 1 S	--	8.1	2630	121	83	329	--	--	232	437	517	3.5	--	0.14	--		644
8-22-52				6.04	6.83	14.30			3.80	9.10	14.58	0.06					
				22	25	53			14	33	53					1605	
7S/ 2W-10D 1 S	--	7.5	1490	82	41	180	1	0	365	153	204	9.0	0.4	0.23	30	906	373
12-21-62				4.09	3.37	7.83	0.03		5.98	3.19	5.75	0.15					
				27	22	51			40	21	38	1				880	
7S/ 2W-14D 1 S	--	7.7	1310	137	35	88	4	0	89	297	165	7.0	0.2	0.08	28	846	486
12-21-62				6.84	2.88	3.83	0.10		1.46	6.18	4.65	0.11					
				50	21	28	1		12	50	38	1				805	
7S/ 2W-20P 1 S	--	8.1	400	31	7	38	--	--	134	7	25	25.7	--	0.60	--		107
8-26-52				1.55	0.58	1.65			2.20	0.15	0.71	0.41					
				41	15	44			63	4	20	12				200	
7S/ 2W-21E 1 S	--	7.4	500	46	16	34	1	0	219	14	35	9.0	0.2	0.07	36	322	181
1- 9-63				2.30	1.32	1.48	0.03		3.59	0.29	0.99	0.15					
				45	26	29	1		72	6	20	3				299	
7S/ 2W-26N 1 S	--	7.7	680	45	14	85	2	0	196	24	110	12	0.2	0.08	37	408	170
12-21-62				2.25	1.15	3.70	0.05		3.21	0.50	3.10	0.19					
				31	16	52	1		46	7	44	3				426	
7S/ 2W-30D 1 S	--	8.2	445	14	2	72	2	0	88	12	71	7.0	2.0	0.60	20		43
11- 9-62				0.70	0.16	3.13	0.05		1.44	0.25	2.00	0.11					
				17	4	77	1		38	7	53	3				246	
7S/ 3W-12H 1 S	--	7.8	610	45	30	36	2	0	171	27	76	41	0.2	0.12	29	416	236
11- 9-62				2.25	2.47	1.57	0.05		2.80	0.56	2.14	0.66					
				35	39	25	1		45	9	35	11				370	
7S/ 3W-24A 1 S	--	8.0	540	29	7	73	1	0	1	25	73	13	0.6	0.08	21	320	102
5- 2-63				1.45	0.58	3.17	0.03		0.02	0.52	2.06	0.21					
				28	11	61	1		1	19	73	7				243	
7S/ 3W-25E 1 S	--	7.9	481	16	6	63	1	0	105	8	64	14	0.4	0.34	20	314	65
2-26-59				0.80	0.49	2.74	0.03		1.72	0.17	1.80	0.23					
				20	12	67	1		44	4	46	6				244	
7S/ 3W-25M 1 S	--	--	348	--	--	69	--	21	85	15	39	--	--	0.24	--		
3- 3-38						3.00		0.70	1.39	0.31	1.10						
7S/ 3W-35B 1 S	--	8.3	487	19	0	85	1	0	101	16	85	11	0.4	0.20	17	284	48
5- 2-63				0.95		3.70	0.03		1.66	0.33	2.40	0.18					
				20		79	1		36	7	53	4				284	
7S/ 3W-35B 2 S	--	--	630	12	1	112	--	--	88	23	128	4	--	--	--	369	34
0- 0-39				0.60	0.08	4.87			1.44	0.48	3.61	0.06					
				11	1	88			26	9	65	1				323	
PECHANGA HYDRO SUBUNIT 202E0																	
8S/ 2W-11J 1 S	--	8.2	1290	--	--	--	--	0	265	--	151	--	--	--	--		358
6-10-60									4.34		4.26						
8S/ 2W-11L 1 S	--	7.5	1290	110	28	130	4	0	300	206	145	9.0	0.4	0.20	20	870	390
1-18-63				5.49	2.30	5.65	0.10		4.92	4.29	4.09	0.15					
				41	17	42	1		37	32	30	1				800	
8S/ 2W-11P 1 S	--	9.2	450	2	1	111	--	24	104	50	50	--	--	0.80	13	354	9
8- 5-52				0.10	0.08	4.83		0.80	1.70	1.04	1.41						
8S/ 2W-12H 1 S	--	7.9	923	74	20	89	3	--	256	126	96	7.0	0.4	0.22	--		267
5-26-54				3.69	1.64	3.87	0.08		4.20	2.62	2.71	0.11				607	
				40	18	42	1		44	27	28	1				541	
8S/ 2W-12J 1 S	--	7.7	1400	99	30	175	5	0	329	255	145	4.0	0.4	0.31	21	926	371
1-18-63				4.94	2.47	7.61	0.13		5.39	5.31	4.09	0.06					
				33	16	50	1		36	36	28					896	
8S/ 2W-12K 1 S	--	8.0	980	71	9	129	--	--	268	163	106	4.7	--	0	--		214
2- 9-51				3.54	0.74	5.61			4.39	3.39	2.99	0.08					
				36	7	57			40	31	28	1				614	
8S/ 2W-15C 1 S	--	8.9	500	3	2	107	1	3	159	4	69	4.2	1.5	0.70	--		16
5-26-54				0.15	0.16	4.65	0.03	0.10	2.61	0.08	1.95	0.07				301	
				3	3	93	1	2	54	2	41	1				274	

SANTA MARGARITA HYDRO UNIT 20200

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
PECHANGA HYDRO SUBUNIT 202E0																	
8S/ 2W-16A 1 S	--	8.2	643	34	8	88	2	--	171	7	103	15	0.6	0.20	--		118
5-26-54				1.70	0.66	3.83	0.05		2.80	0.15	2.90	0.24				376	
				27	11	61	1		46	2	48	4				342	
8S/ 2W-16G 1 S	--	8.3	652	15	1	112	2	--	134	31	103	16	0.6	0.25	--		42
5-26-54				0.75	0.08	4.87	0.05		2.20	0.65	2.90	0.26				378	
				13	1	85	1		37	11	48	4				347	
8S/ 2W-17G 1 S	--	8.6	530	5	1	113	--	57	0	28	92	15	--	0.26	--		17
2- 9-51				0.25	0.08	4.91		1.90		0.58	2.59	0.24					
				5	2	94		36		11	49	5				311	
8S/ 2W-17M 1 S	--	9.1	450	8	0	96	1	21	103	10	60	3.0	4.0	0.77	15	286	20
1-18-63				0.40		4.17	0.03	0.70	1.69	0.21	1.69	0.05					
				9		91	1	16	39	5	39	1				269	
8S/ 2W-19J 1 S	--	--	--	52	16	43	--	12	193	17	50	28	--	--	37	369	196
7- 0-10				2.59	1.32	1.87		0.40	3.16	0.35	1.41	0.45					
				45	23	32		7	55	6	24	8				350	
8S/ 2W-19Q 1 S	--	7.5	440	39	10	37	0	0	134	15	51	30	0.2	0.02	42	264	139
8- 7-62				1.95	0.82	1.61			2.20	0.31	1.44	0.48					
				45	19	37			50	7	33	11				290	
8S/ 2W-20B 4 S	--	7.7	780	57	11	93	3	0	189	111	86	6.0	0.4	0.18	16	588	187
1-18-63				2.84	0.90	4.04	0.08		3.10	2.31	2.43	0.10					
				36	11	51	1		39	29	31	1				476	
8S/ 2W-20L 1 S	--	--	475	47	9	42	--	--	207	17	35	6	--	--	--	363	155
0- 0-39				2.35	0.74	1.83			3.39	0.35	0.99	0.10					
				48	15	37			70	7	20	2				258	
8S/ 2W-22L 1 S	--	8.2	340	14	8	48	--	--	116	3	50	1.4	--	0.01	--		68
3-12-53				0.70	0.66	2.09			1.90	0.06	1.41	0.02					
				20	19	61			56	2	42	1				181	
8S/ 2W-28M 1 S	70	8.5	420	12	1	75	1	2	81	16	70	0	2.5	0.72	13		34
5- 1-62				0.60	0.08	3.26	0.03	0.07	1.33	0.33	1.97					302	
				15	2	82	1	2	36	9	53					233	
8S/ 2W-29G 1 S	--	7.9	630	38	13	75	--	--	177	50	85	2.7	--	--	--		149
3-25-52				1.90	1.07	3.26			2.90	1.04	2.40	0.04					
				30	17	52			45	16	38	1				351	
8S/ 3W-24A 1 S	--	6.9	467	26	13	51	2	0	128	24	64	1.2	0.5	0.08	42	318	119
5- 8-59				1.30	1.07	2.22	0.05		2.10	0.50	1.80	0.02					
				28	23	48	1		48	11	41					287	
8S/ 3W-24H 2 S	--	7.1	333	22	4	35	3	0	98	10	38	37	0.5	0.21	51	224	72
5- 8-59				1.10	0.33	1.52	0.08		1.61	0.21	1.07	0.60					
				36	11	50	3		46	6	31	17				249	
8S/ 3W-33Q 1 S	--	7.0	1390	122	53	93	4	0	357	125	208	7.0	0.2	0.20	26	988	523
1-18-63				6.09	4.36	4.04	0.10		5.85	2.60	5.87	0.11					
				42	30	28	1		41	18	41	1				814	
WILSON HYDRO SUBUNIT 202F0																	
7S/ 1E-13P 1 S	--	7.2	1160	90	51	107	7	0	333	257	94	0	0.6	0.15	16	792	434
12-13-62				4.49	4.19	4.65	0.18		5.46	5.35	2.65						
				33	31	34	1		41	40	20					786	
7S/ 1E-17G 1 S	--	7.4	540	44	11	68	1	0	238	14	63	0	0.4	0.11	26	336	155
12-12-62				2.20	0.90	2.96	0.03		3.90	0.29	1.78						
				36	15	49			65	5	30					345	
7S/ 1E-18K 1 S	--	7.0	600	42	18	59	4	0	172	54	73	0	0.6	0.09	29	372	179
12-12-62				2.10	1.48	2.57	0.10		2.82	1.12	2.06						
				34	24	41	2		47	19	34					364	
7S/ 1E-20Q 1 S	74	7.8	470	33	10	50	2	0	188	7	48	6.5	0.4	0.14	39	285	124
10-30-62				1.65	0.82	2.17	0.05		3.08	0.15	1.35	0.10					
				35	17	46	1		66	3	29	2				288	
7S/ 1E-24F 1 S	--	7.8	1080	102	30	93	6	0	321	214	76	0	0.6	0.15	24	710	378
12-13-62				5.09	2.47	4.04	0.15		5.26	4.46	2.14						
				43	21	34	1		44	38	18					704	
7S/ 1E-24Q 1 S	--	7.8	780	44	15	91	3	0	271	32	76	0	0.4	0.11	21	400	172
12-13-62				2.20	1.23	3.96	0.08		4.44	0.67	2.14						
				29	16	53	1		61	9	30					416	
7S/ 1E-26K 1 S	68	6.9	680	46	10	87	3	0	207	13	113	0	0.4	0.07	3	346	156
12-13-62				2.30	0.82	3.78	0.08		3.39	0.27	3.19						
				33	12	54	1		49	4	47					377	
7S/ 1E-29E 1 S	--	7.7	532	35	12	58	2	0	200	8	58	13	0.5	0.08	39	310	137
10-30-62				1.75	0.99	2.52	0.05		3.28	0.17	1.64	0.21					
				33	19	47	1		62	3	31	4				324	

SANTA MARGARITA HYDRO UNIT 20200

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
WILSON HYDRO SUBUNIT 202F0																	
7S/ 1E-30H 1 S	--	7.8	720	42	20	107	--	0	287	51	85	6.2	--	0.05	--		187
2- 2-51				2.10	1.64	4.65			4.70	1.06	2.40	0.10					
				25	20	55			57	13	29	1				452	
7S/ 1E-30H 2 S	--	7.5	1256	97	46	105	6	0	193	312	125	1.0	0.7	0.10	39	855	431
10-30-62				4.84	3.78	4.57	0.15		3.16	6.50	3.53	0.02					
				36	28	34	1		24	49	27					827	
7S/ 1E-30J 2 S	--	7.7	1000	62	33	129	--	0	268	130	152	3.3	--	0.10	--		290
2- 2-51				3.09	2.71	5.61			4.39	2.71	4.29	0.05					
				27	24	49			38	24	38					641	
7S/ 1E-30J 3 S	--	7.8	1656	123	58	151	5	0	417	191	232	12	0.5	0.15	42	1060	546
10-30-62				6.14	4.77	6.57	0.13		6.83	3.98	6.54	0.19					
				35	27	37	1		39	23	37	1				1020	
7S/ 1E-30J 4 S	68	7.9	762	48	18	86	3	0	246	61	82	3.5	0.5	0.12	40	450	194
10-30-62				2.40	1.48	3.74	0.08		4.03	1.27	2.31	0.06					
				31	19	49	1		53	17	30	1				463	
8S/ 1E- 7Q 1 S	--	7.5	1250	73	27	257	--	--	311	241	241	1.0	--	--	--		293
3-12-52				3.64	2.22	11.17			5.10	5.02	6.80	0.02					
				21	13	66			30	30	40					993	
8S/ 1E- 7Q 4 S	--	8.0	1750	90	36	248	5	0	327	371	201	0	0.8	0.32	23	1188	373
5- 2-63				4.49	2.96	10.78	0.13		5.36	7.72	5.67						
				24	16	59	1		29	41	30					1136	
8S/ 1E-17A 2 S	--	7.9	750	26	5	114	5	0	132	79	105	3.8	1.2	0.32	22	435	86
11- 2-62				1.30	0.41	4.96	0.13		2.16	1.64	2.96	0.06					
				19	6	73	2		32	24	43	1				426	
8S/ 1E-17E 2 S	67	7.7	1481	64	23	220	6	0	303	183	205	3.4	0.9	0.24	25	880	254
11- 2-62				3.19	1.89	9.57	0.15		4.97	3.81	5.78	0.05					
				22	13	65	1		34	26	40					879	
8S/ 1E-18C 1 S	69	7.9	1575	61	10	251	2	0	234	194	244	11	0.7	0.35	25	930	193
11- 2-62				3.04	0.82	10.91	0.05		3.84	4.04	6.88	0.18					
				21	6	74			26	27	46	1				914	
8S/ 1E-18H 1 S	72	7.9	1570	64	29	228	5	0	320	208	216	3.6	0.9	0.26	24	940	279
11- 2-62				3.19	2.38	9.91	0.13		5.24	4.33	6.09	0.06					
				20	15	63	1		33	28	39					936	
8S/ 1E-18K 1 S	--	8.8	1370	8	1	336	--	--	244	188	256	1	--	0.16	--		24
11-16-51				0.40	0.08	14.61			4.00	3.91	7.22	0.02					
				3	1	97			26	26	48					910	
8S/ 1E-18K 2 S	--	8.2	1337	18	4	240	1	0	198	157	194	3.6	0.7	0.20	16	770	62
11- 2-62				0.90	0.33	10.44	0.03		3.25	3.27	5.47	0.06					
				8	3	89			27	27	45					732	
8S/ 1W-12K 1 S	--	7.5	1810	90	29	275	6	0	321	313	263	2.0	0.6	0.33	24	1112	344
8-21-63				4.49	2.38	11.96	0.15		5.26	6.52	7.42	0.03					
				24	13	63	1		27	34	39					1161	
ANZA HYDRO SUBUNIT 202G0																	
7S/ 2E-13Q 1 S	--	7.3	538	59	9	34	5	0	128	25	34	105	0.2	0.02	35	383	184
5- 1-63				2.94	0.74	1.48	0.13		2.10	0.52	0.96	1.69					
				56	14	28	2		40	10	18	32				369	
7S/ 2E-13Q 2 S	--	7.7	210	23	5	19	--	--	85	10	7	29	--	0	--		78
11-21-51				1.15	0.41	0.83			1.39	0.21	0.20	0.47					
				48	17	35			61	9	9	21				135	
7S/ 2E-22K 1 S	65	8.4	300	16	2	43	3	5	98	19	29	0.5	0.3	0.06	24	180	48
11- 2-62				0.80	0.16	1.87	0.08	0.17	1.61	0.40	0.82	0.01					
				27	5	64	3	6	53	13	27					190	
7S/ 2E-26B 1 S	--	7.7	330	32	7	21	4	0	113	14	31	5.0	0.1	0.12	29		109
5- 1-62				1.60	0.58	0.91	0.10		1.85	0.29	0.87	0.08				188	
				50	18	29	3		60	9	28	3				199	
7S/ 2E-32A 2 S	63	7.9	381	28	7	40	1	0	127	23	32	13	0.4	0.06	32	230	99
11- 2-62				1.40	0.58	1.74	0.03		2.08	0.48	0.90	0.21					
				37	15	46	1		57	13	25	6				239	
7S/ 2E-32F 1 S	--	7.9	1163	66	20	171	6	--	232	182	160	3.0	0.5	0.15	--		247
12- 9-53				3.29	1.64	7.44	0.15		3.80	3.79	4.51	0.05				724	
				26	13	59	1		31	31	37					723	
7S/ 2E-32J 1 S	64	8.0	354	14	1	57	3	0	90	16	55	1.0	0.3	0.04	17	295	39
11- 2-62				0.70	0.08	2.48	0.08		1.48	0.33	1.55	0.02					
				21	2	74	2		44	10	46	1				209	
7S/ 2E-33C 1 S	65	7.6	637	48	10	70	4	0	211	31	76	4.3	0.3	0	--	376	161
9-13-55				2.40	0.82	3.04	0.10		3.46	0.65	2.14	0.07					
				38	13	48	2		55	10	34	1				347	

ANZA HYDRO SUBUNIT Z02G0 SANTA MARGARITA HYDRO UNIT Z0200

State well number Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C Evap 105°C Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
7S/ 3E- 7R 1 S 9- 2-54	71	7.1	1217	162 8.08 63	36 2.96 23	35 1.52 12	10 0.26 2	--	104 1.70 14	307 6.39 52	135 3.81 31	23.4 0.38 3	0.1	0.02	--	969 760	552
7S/ 3E- 8Q 2 S 10-31-62	68	7.6	782	83 4.14 51	21 1.73 21	47 2.04 25	6 0.15 2	0	232 3.80 47	128 2.66 33	56 1.58 19	7.4 0.12 1	0.5	0.02	31	500 494	294
7S/ 3E-10L 1 S 11- 1-62	--	7.6	773	80 3.99 49	20 1.64 20	55 2.39 29	4 0.10 1	0	332 5.44 67	39 0.81 10	65 1.83 23	1.0 0.02	0.4	0.02	30	450 458	282
7S/ 3E-14C 1 S 11- 1-62	--	7.8	1008	98 4.89 49	20 1.64 17	74 3.22 33	6 0.15 2	0	320 5.24 53	161 3.35 34	43 1.21 12	4.5 0.07 1	0.8	0.04	29	595 594	327
7S/ 3E-15P 1 S 11- 1-62	--	8.1	672	58 2.89 42	12 0.99 14	68 2.96 43	3 0.08 1	0	234 3.84 56	61 1.27 19	60 1.69 25	3.0 0.05 1	0.8	0.02	25	405 406	194
7S/ 3E-16P 1 S 10-31-62	64	7.0	509	27 1.35 28	14 1.15 24	48 2.09 44	6 0.15 3	0	66 1.08 25	77 1.60 37	53 1.49 35	7.0 0.11 3	0.6	0.02	57	350 322	125
7S/ 3E-17B 2 S 10-31-62	66	8.1	797	82 4.09 49	19 1.56 19	60 2.61 31	3 0.08 1	0	278 4.56 53	91 1.89 22	54 1.52 18	40 0.65 8	0.5	0.02	29	490 515	283
7S/ 3E-17C 1 S 5-21-53	--	7.6	790	60 2.99 38	23 1.89 24	68 2.96 38	--	--	208 3.41 47	89 1.85 25	60 1.69 23	23 0.37 5	--	0.10	--	425	244
7S/ 3E-20A 1 S 5-23-56	67	7.6	898	72 3.59 40	23 1.89 21	77 3.35 37	5 0.13 1	0	162 2.66 30	162 3.37 38	96 2.71 30	14 0.23 3	0.2	0.15	--	613 529	274
7S/ 3E-20B 1 S 9- 2-54	62	7.1	748	76 3.79 50	20 1.64 21	47 2.04 27	7 0.18 2	--	229 3.75 50	82 1.71 23	64 1.80 24	12.5 0.20 3	0.5	0.12	--	480 422	272
7S/ 3E-20C 1 S 9- 3-54	--	7.3	610	74 3.69 58	8 0.66 10	42 1.83 29	5 0.13 2	--	235 3.85 60	16 0.33 5	71 2.00 31	18.2 0.29 4	0	0.11	--	394 350	218
7S/ 3E-20C 2 S 10-19-54	--	7.8	810	81 4.04 52	17 1.40 18	50 2.17 28	8 0.20 3	0	96 1.57 20	184 3.83 49	83 2.34 30	5.0 0.08 1	0.2	0	--	557 475	272
7S/ 3E-20D 2 S 10-31-62	64	7.4	451	40 2.00 47	7 0.58 14	35 1.52 36	5 0.13 3	0	173 2.84 65	10 0.21 5	38 1.07 24	16 0.26 6	0.3	0.06	37	300 273	129
7S/ 3E-20E 2 S 10-31-62	63	7.6	508	51 2.54 51	11 0.90 18	32 1.39 28	7 0.18 4	0	188 3.08 60	7 0.15 3	50 1.41 27	32 0.52 10	0.2	0.04	24	310 307	172
7S/ 3E-20G 1 S 10-31-62	65	7.8	580	54 2.69 47	14 1.15 20	40 1.74 30	7 0.18 3	0	139 2.28 39	110 2.29 39	42 1.18 20	4.0 0.06 1	0.4	0	18	360 358	192
7S/ 3E-20H 1 S 9- 2-54	--	7.3	572	60 2.99 52	12 0.99 17	37 1.61 28	6 0.15 3	--	149 2.44 43	102 2.12 37	39 1.10 19	2.3 0.04 1	0.5	0.12	--	369 332	199
7S/ 3E-20J 1 S 5- 1-62	--	7.2	715	74 3.69 50	16 1.32 18	51 2.22 30	5 0.13 2	0	146 2.39 33	136 2.83 39	65 1.83 25	11 0.18 2	0.3	0.10	32	502 462	251
7S/ 3E-20J 2 S 9- 2-54	--	7.1	748	80 3.99 54	14 1.15 16	48 2.09 28	6 0.15 2	--	159 2.61 35	131 2.73 36	67 1.89 25	15.3 0.25 3	0.1	0.15	--	504 440	257
7S/ 3E-20J 3 S 10-31-62	--	7.4	716	60 2.99 43	14 1.15 17	60 2.61 38	6 0.15 2	0	122 2.00 29	138 2.87 41	74 2.09 30	2.4 0.04 1	0.5	0	28	460 443	207
7S/ 3E-21G 1 S 6- 5-57	66	7.8	855	59 2.94 36	17 1.40 17	84 3.65 45	4 0.10 1	0	183 3.00 36	130 2.71 33	88 2.48 30	6.6 0.11 1	0.5	0.18	27	550 506	217
7S/ 3E-21K 1 S 11-29-51	--	8.0	760	58 2.89 38	17 1.40 18	78 3.39 44	--	--	183 3.00 40	110 2.29 30	71 2.00 27	15 0.24 3	--	0	--	439	215
7S/ 3E-21K 3 S 11- 1-62	--	7.4	747	61 3.04 41	17 1.40 19	68 2.96 39	4 0.10 1	0	193 3.16 42	98 2.04 27	66 1.86 25	24 0.39 5	0.4	0.02	35	475 468	222
7S/ 3E-21L 1 S 5-27-53	--	7.6	750	66 3.29 41	20 1.64 21	70 3.04 38	--	--	213 3.49 45	96 2.00 26	67 1.89 24	21 0.34 4	--	0.08	--	445	247

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
SANTA MARGARITA HYDRO UNIT 20200																	
ANZA HYDRO SUBUNIT 202G0																	
7S/ 3E-21P 1 S	64	7.2	793	53	10	92	5	0	107	167	83	4.0	0.4	0.06	8	485	173
11- 1-62				2.64	0.82	4.00	0.13		1.75	3.48	2.34	0.06					
				35	11	53	2		23	46	31	1				475	
7S/ 3E-22B 5 S	64	7.3	1410	150	41	110	4	0	232	485	54	13	0.9	0.08	29	1030	543
11- 1-62				7.49	3.37	4.78	0.10		3.80	10.10	1.52	0.21					
				48	21	30	1		24	65	10	1				1001	
7S/ 3E-22Q 1 S	60	7.8	1340	137	32	103	7	0	301	113	218	21	0.3	0.12	36		474
5- 1-62				6.84	2.63	4.48	0.18		4.93	2.35	6.15	0.34				1000	
				48	19	32	1		36	17	45	2				815	
7S/ 3E-22Q 7 S	--	7.5	717	71	14	55	7	0	193	100	70	2.0	0.4	0.04	35	465	235
11- 1-62				3.54	1.15	2.39	0.18		3.16	2.08	1.97	0.03					
				49	16	33	2		44	29	27					449	
7S/ 3E-23Q 1 S	--	8.3	994	82	26	90	6	19	290	39	115	49	0.6	0.04	30	600	312
11- 1-62				4.09	2.14	3.91	0.15	0.63	4.75	0.81	3.24	0.79					
				40	21	38	1	6	46	8	32	8				599	
7S/ 3E-23R 2 S	--	8.2	1039	72	28	123	5	0	397	45	98	76	0.4	0.15	21	658	295
11-22-57				3.59	2.30	5.35	0.13		6.51	0.94	2.76	1.23					
				32	20	47	1		57	8	24	11				664	
7S/ 3E-27M 1 S	--	8.3	790	86	22	83	--	--	140	240	82	2.0	--	0.17	--		305
11-20-51				4.29	1.81	3.61			2.29	5.00	2.31	0.03					
				44	19	37			24	52	24					584	
8S/ 2E- 5A 1 S	63	8.1	415	15	3	63	4	0	81	13	75	3.0	0.3	0.02	24	230	50
11- 2-62				0.75	0.25	2.74	0.10		1.33	0.27	2.12	0.05					
				20	7	71	3		35	7	56	1				240	
8S/ 2E- 5C 1 S	65	7.6	363	21	7	38	5	0	105	7	52	1.0	0.4	0.02	45	210	82
11- 2-62				1.05	0.58	1.65	0.13		1.72	0.15	1.47	0.02					
				31	17	48	4		51	4	44	1				228	
8S/ 3E- 8C 1 S	67	8.3	240	22	6	--	--	--	110	2	12	23	--	0.08	--		80
11-21-51				1.10	0.49				1.80	0.04	0.34	0.37					
AGUANGA HYDRO SUBUNIT 202H0																	
8S/ 1E- 7N 1 S	--	7.6	1620	71	28	259	8	0	317	226	236	1.6	1.0	0.37	--		292
9-13-55				3.54	2.30	11.26	0.20		5.20	4.71	6.66	0.03					
				20	13	65	1		31	28	40					987	
8S/ 1E-19F 1 S	--	7.7	2450	298	10	201	4	--	168	97	706	8.1	0.4	0.10	--	1805	785
11-12-53				14.87	0.82	8.74	0.10		2.75	2.02	19.91	0.13					
				61	3	36			11	8	80	1				1407	
8S/ 1E-19F 3 S	--	8.0	1180	155	9	69	--	--	177	27	277	12	--	0.14	--		424
11-16-50				7.73	0.74	3.00			2.90	0.56	7.81	0.19					
				67	6	26			25	5	68	2				636	
8S/ 1E-19H 1 S	--	8.1	1460	159	12	140	--	--	140	118	359	4.8	--	0.30	--		446
11-16-50				7.93	0.99	6.09			2.29	2.46	10.12	0.08					
				53	7	41			15	16	68	1				862	
8S/ 1E-19H 2 S	72	7.6	1438	102	8	171	3	0	132	106	315	3.1	0.9	0.61	19	859	288
11- 1-62				5.09	0.66	7.44	0.08		2.16	2.21	8.88	0.05					
				38	5	56	1		16	17	67					794	
8S/ 1E-19H 3 S	--	7.5	3220	363	29	--	--	--	146	124	975	13	--	0.45	--		1025
1-16-51				18.11	2.38				2.39	2.58	27.50	0.21					
8S/ 1E-19H 4 S	--	8.4	848	18	4	175	2	--	122	76	174	2.0	0.9	0.42	--		62
11-12-53				0.90	0.33	7.61	0.05		2.00	1.58	4.91	0.03				530	
				10	4	86	1		23	19	56					512	
8S/ 1E-19J 1 S	--	7.9	2300	304	25	175	--	--	232	254	560	5.3	--	0.09	--		862
11-16-50				15.17	2.06	7.61			3.80	5.29	15.79	0.09					
				61	8	31			15	21	63					1437	
8S/ 1E-19K 1 S	--	7.5	1370	159	31	139	--	--	482	276	103	3.7	--	0.17	--		524
11-17-50				7.93	2.55	6.04			7.90	5.75	2.90	0.06					
				48	15	37			48	35	17					949	
8S/ 1E-19K 3 S	--	7.2	1704	169	41	156	2	0	432	304	184	6.0	0.7	0.20	48	1145	590
11- 1-62				8.43	3.37	6.78	0.05		7.08	6.33	5.19	0.10					
				45	18	36			38	34	28	1				1123	
8S/ 1E-19Q 1 S	--	8.3	1440	133	34	175	--	--	403	269	160	2.4	--	0.32	--		472
11-19-51				6.64	2.80	7.61			6.61	5.60	4.51	0.04					
				39	16	45			39	33	27					972	
8S/ 1E-19Q 2 S	--	7.6	1204	93	23	130	4	0	301	224	107	0	0.3	0	31	865	327
4-27-62				4.64	1.89	5.65	0.10		4.93	4.66	3.02						
				38	15	46	1		39	37	24					760	

SANTA MARGARITA HYDRO UNIT 20200

AGUANGA HYDRO SUBUNIT 202H0

State well number Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C Evap 105°C Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million, equivalents per million, percent reactance value									Chemical constituents in parts per million				
8S/ 1E-20M 1 S 11-16-50	--	8.1	710	41 2.05 27	6 0.49 6	118 5.13 67	--	--	171 2.80 37	78 1.62 22	106 2.99 40	3.6 0.06 1	--	0.58	--	437	127
8S/ 1E-20M 2 S 11-16-50	--	8.3	530	11 0.55 10	1 0.08 1	114 4.96 89	--	--	134 2.20 40	34 0.71 13	89 2.51 46	2.4 0.04 1	--	0.61	--	318	32
8S/ 1E-20M 3 S 10-31-62	--	7.9	729	27 1.35 20	2 0.16 2	120 5.22 78	0	0	144 2.36 35	75 1.56 23	101 2.85 42	0.5 0.01	1.2	0.56	44	455 442	76
8S/ 1E-20P 2 S 4-15-54	--	9.4	362	3 0.15 4	1 0.08 2	93 4.04 95	0	7 0.23 5	118 1.93 45	15 0.31 7	64 1.80 42	1.5 0.02	1.8	0.72	--	269 245	12
8S/ 1E-20R 1 S 11- 1-62	--	8.1	454	4 0.20 5	0	94 4.09 95	1 0.03 1	0	129 2.11 49	12 0.25 6	67 1.89 43	6.0 0.10 2	0.5	0.34	22	270 270	10
8S/ 1E-26M 3 S 12-18-62	--	7.5	880	82 4.09 43	18 1.48 16	90 3.91 41	2 0.05 1	0	272 4.46 48	133 2.77 30	73 2.06 22	0	0.4	0.18	26	540 558	279
8S/ 1E-27Q 1 S 11-19-58	--	7.6	921	73 3.64 40	10 0.82 9	105 4.57 50	2 0.05 1	0	245 4.02 43	103 2.14 23	108 3.05 33	5 0.08 1	0.7	0.16	32	648 559	223
8S/ 1E-28Q 1 S 11- 2-62	--	7.6	909	54 2.69 31	4 0.33 4	128 5.57 65	1 0.03	0	138 2.26 26	193 4.02 46	84 2.37 27	2.2 0.04	0.7	0.45	25	558 560	151
8S/ 1E-29J 1 S 3-25-52	--	7.4	300	25 1.25 38	13 1.07 32	23 1.00 30	--	--	165 2.70 83	1 0.02 1	18 0.51 16	1.5 0.02 1	--	0.08	--	163	116
8S/ 1E-29Q 2 S 11- 1-62	--	8.1	1264	9 0.45 4	3 0.25 2	270 11.74 94	1 0.03	0	351 5.75 45	200 4.16 32	103 2.90 23	2.0 0.03	0.7	0.22	16	760 777	35
8S/ 1E-33F 1 S 11- 2-62	--	7.9	754	88 4.39 54	20 1.64 20	45 1.96 24	3 0.08 1	0	198 3.25 40	185 3.85 48	32 0.90 11	2.5 0.04	0.4	0.04	32	520 505	302
8S/ 1E-33G 1 S 8-21-62	72	7.4	940	109 5.44 54	22 1.81 18	61 2.65 26	5 0.13 1	0	331 5.43 45	253 5.27 43	50 1.41 12	2.0 0.03	0.4	0.05	24	636 689	363
8S/ 1E-34P 1 S 11- 2-62	--	7.4	725	75 3.74 51	13 1.07 15	56 2.43 33	4 0.10 1	0	211 3.46 48	96 2.00 ~~28~~	61 1.72 24	3.4 0.05 1	0.6	0.07	31	431 444	241
8S/ 1E-36N 1 S 6-11-64	66	8.3	520	38 1.90 35	11 0.90 16	61 2.65 48	2 0.05 1	6 0.20 4	165 2.70 51	14 0.29 5	61 1.72 33	23 0.37 7	0.6	0.24	--	322 298	140
8S/ 1W-13K 1 S 11-27-51	--	7.9	1130	44 2.20	50 4.11	--	--	--	409 6.70	1 0.02	170 4.79	1 0.02	--	2.72	--		316
8S/ 1W-13P 1 S 12-20-62	--	7.4	1330	116 5.79 41	36 2.96 21	118 5.13 37	5 0.13 1	0	293 4.80 34	279 5.81 42	115 3.24 23	5.0 0.08 1	0.4	0.30	26	816 845	438
8S/ 1W-13Q 1 S 12-20-62	--	8.1	1310	61 3.04 22	68 5.59 41	113 4.91 36	5 0.13 1	0	290 4.75 35	271 5.64 41	114 3.21 23	5.0 0.08 1	0.4	0.27	26	862 806	432
8S/ 1W-22G 1 S 12-20-62	--	7.5	735	80 3.99 53	13 1.07 14	55 2.39 32	3 0.08 1	0	265 4.34 58	86 1.79 24	48 1.35 18	0	0.2	0.10	29	424 445	253
8S/ 1W-22K 1 S 8-21-62	66	7.0	625	58 2.89 42	16 1.32 19	58 2.52 37	3 0.08 1	0	235 3.85 57	76 1.58 23	47 1.33 20	0	0.4	0.08	32	388 406	211
8S/ 1W-25Q 1 S 10-30-62	--	7.8	1007	91 4.54 41	50 4.11 37	56 2.43 22	2 0.05	0	359 5.88 53	135 2.81 25	73 2.06 19	19 0.31 3	0.6	0.06	47	660 650	433
8S/ 1W-36Q 1 S 10-30-62	--	8.9	267	6 0.30 11	1 0.08 3	51 2.22 84	2 0.05 2	16 0.53 21	78 1.28 51	14 0.29 12	14 0.39 16	1.1 0.02 1	1.7	0.52	33	140 179	19
9S/ 1W- 1FS1 S 10-30-62	--	7.9	492	58 02.89 56	8 060.66 13	35 1.52 30	3 0.08 2	0 • 3	244 64.00 77	18 0.37 7	28 0.79 15	0.5 0.01	0.5	0.06	45	300 316	178

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
SANTA MARGARITA HYDRO UNIT 20200																	
OAKGROVE HYDRO SUBUNIT 20210																	
9S/ 1E- 1Q 1 S	--	8.5	550	8	1	112	3	6	109	75	66	0	0.4	0.33	26	356	24
12-18-62				0.40	0.08	4.87	0.08	0.20	1.79	1.56	1.86						
				7	1	90	1	4	33	29	34					351	
9S/ 1E-12A 1 S	--	7.5	1220	119	33	122	6	0	378	261	85	6.0	0.2	0.10	28	872	433
8-21-62				5.94	2.71	5.30	0.15		6.20	5.43	2.40	0.10					
				42	19	38	1		44	38	17	1				846	
9S/ 2E- 7G 1 S	--	8.0	610	53	10	61	3	0	254	11	59	2.1	0.4	0.05	26	346	173
10-14-61				2.64	0.82	2.65	0.08		4.16	0.23	1.66	0.03					
				43	13	43	1		68	4	27					352	
9S/ 2E- 8Q 2 S	--	7.4	345	32	6	31	2	0	121	11	22	36	0.2	0.10	28	238	105
12-19-62				1.60	0.49	1.35	0.05		1.98	0.23	0.62	0.58					
				46	14	39	1		58	7	18	17				228	
9S/ 2E-15R 1 S	--	7.6	540	44	15	55	--	--	293	6	27	2.5	--	0	--		172
11-30-51				2.20	1.23	2.39			4.80	0.12	0.76	0.04					
				38	21	41			84	2	13	1				294	
9S/ 2E-16N 3 S	--	8.1	532	52	12	46	2	0	260	17	30	3.0	0.2	0.08	25	296	179
12-18-62				2.59	0.99	2.00	0.05		4.26	0.35	0.85	0.05					
				46	18	36	1		77	6	15	1				315	
9S/ 2E-17K 1 S	74	7.9	665	66	15	55	2	0	220	93	40	12	0.2	0.07	--	410	226
7-16-64				3.29	1.23	2.39	0.05		3.61	1.94	1.13	0.19					
				47	18	34	1		53	28	16	3				391	
9S/ 2E-22J 1 S	--	7.3	480	34	18	46	3	0	232	30	28	3.0	0.2	0.07	23	304	159
12-19-62				1.70	1.48	2.00	0.08		3.80	0.62	0.79	0.05					
				32	28	38	2		72	12	15	1				299	
9S/ 2E-27J 1 S	--	8.5	370	50	10	32	--	0	201	18	18	4.0	--	0.13	--		166
11-21-51				2.50	0.82	1.39			3.29	0.37	0.51	0.06					
				53	17	30			78	9	12	1				231	
9S/ 3E-16A 1 S	--	7.8	560	60	15	58	--	--	305	14	39	7.1	--	--	--		211
12- 8-50				2.99	1.23	2.52			5.00	0.29	1.10	0.11					
				44	18	37			77	4	17	2				343	
9S/ 3E-16A 2 S	--	7.1	510	48	11	45	3	0	226	7	46	0	0.2	0.05	15	260	165
12-19-62				2.40	0.90	1.96	0.08		3.70	0.15	1.30						
				45	17	37	1		72	3	25					286	
9S/ 3E-16Q 1 S	--	7.6	655	65	23	51	1	0	346	10	48	0	0.2	0.08	35	450	257
12-19-62				3.24	1.89	2.22	0.03		5.67	0.21	1.35						
				44	26	30			78	3	19					403	
SAN LUIS REY HYDRO UNIT 20300																	
BONSALL HYDRO SUBUNIT 203A0																	
10S/ 1W-30P 1 S	72	7.2	1185	91	46	83	5	0	240	47	228	30	0.4	0.04	49	824	416
3-17-64				4.54	3.78	3.61	0.13		3.93	0.98	6.43	0.48					
				38	31	30	1		33	8	54	4				697	
10S/ 2W-22N 1 S	--	7.3	1135	77	44	98	4	0	281	82	180	24	0.5	0.09	39	740	373
6-17-64				3.84	3.62	4.26	0.10		4.61	1.71	5.08	0.39					
				32	31	36	1		39	15	43	3				687	
10S/ 3W- 1L 1 S	68	7.3	960	82	28	82	4	0	254	102	126	11	0.2	0.05	25	586	320
8-22-63				4.09	2.30	3.57	0.10		4.16	2.12	3.55	0.18					
				41	23	35	1		42	21	35	2				585	
10S/ 3W- 3M 1 S	--	7.2	835	50	37	74	1	0	273	61	103	14	0.5	0.09	48	545	277
6-17-64				2.50	3.04	3.22	0.03		4.47	1.27	2.90	0.23					
				28	35	37			50	14	33	3				523	
10S/ 3W-11G 1 S	66	8.0	1140	112	51	98	7	0	248	283	153	6.7	0.2	0.15	28	920	489
10-25-63				5.59	4.19	4.26	0.18		4.06	5.89	4.31	0.11					
				39	29	30	1		28	41	30	1				861	
10S/ 3W-11H 1 S	--	7.4	1250	140	28	75	--	0	235	260	136	--	--	--	23	984	465
3-26-63				6.99	2.30	3.26			3.85	5.41	3.84						
10S/ 3W-11L 2 S	69	6.9	1850	136	125	120	6	0	197	765	130	0	0.2	0.16	26	1626	854
8-20-63				6.79	10.28	5.22	0.15		3.23	15.93	3.67						
				30	46	23	1		14	70	16					1405	
10S/ 3W-11M 1 S	--	7.8	864	66	23	77	--	0	229	72	109	1.0	--	0	--		259
1- 9-51				3.29	1.89	3.35			3.75	1.50	3.07	0.02				528	
				39	22	39			45	18	37					461	
10S/ 3W-11M 2 S	--	7.1	1440	106	72	108	6	0	201	423	149	0	0.2	0.16	30	1104	561
8-21-63				5.29	5.92	4.70	0.15		3.29	8.81	4.20						
				33	37	29	1		20	54	26					993	
10S/ 3W-12C 1 S	--	7.5	1480	122	68	130	8	0	322	346	190	0	0.2	0.18	29	1130	584
10-25-63				6.09	5.59	5.65	0.20		5.28	7.20	5.36						
				35	32	32	1		30	40	30					1052	

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million, equivalents per million, percent reactance value									Chemical constituents in parts per million				
SAN LUIS REY HYDRO UNIT 20300																	
BONSALL HYDRO SUBUNIT 203A0																	
10S/ 3W-12F 1 S	69	7.1	1635	120	45	170	5	0	396	229	207	16	0.4	0.36	27	1165	485
4-26-62				5.99	3.70	7.39	0.13		6.49	4.77	5.84	0.26					
				35	21	43	1		37	27	34	1				1014	
10S/ 3W-15A 1 S	--	7.8	1600	169	71	128	7	0	200	532	201	0	0.6	0.34	--		714
7- 1-55				8.43	5.84	5.57	0.18		3.28	11.08	5.67					1375	
				42	29	28	1		16	55	28					1207	
10S/ 3W-15B 1 S	68	7.8	1222	123	47	74	7	0	199	432	83	0	0.2	0.13	25		501
7-13-61				6.14	3.87	3.22	0.18		3.26	8.99	2.34					1034	
				46	29	24	1		22	62	16					889	
10S/ 3W-15B 2 S	66	6.6	1335	134	43	94	7	0	168	432	103	2.5	0.1	0.07	--		512
6-29-56				6.69	3.54	4.09	0.18		2.75	8.99	2.90	0.04				980	
				46	24	28	1		19	61	20					898	
10S/ 3W-15F 1 S	--	7.3	1402	147	39	132	6	0	264	303	190	0	0.4	0.24	--		528
7- 1-55				7.34	3.21	5.74	0.15		4.33	6.31	5.36					1060	
				45	20	35	1		27	39	34					947	
10S/ 3W-16B 1 S	--	7.2	929	62	40	82	3	0	273	72	141	7.9	0.4	0.04	--		319
8-24-54				3.09	3.29	3.57	0.08		4.47	1.50	3.98	0.13				595	
				31	33	36	1		44	15	39	1				543	
10S/ 3W-16C 1 S	68	7.2	1382	86	63	117	3	0	201	304	167	7	0.6	0.16	35	960	474
4-26-62				4.29	5.18	5.09	0.08		3.29	6.33	4.71	0.11					
				29	35	35	1		23	44	33	1				882	
10S/ 3W-16E 4 S	69	6.5	1420	153	62	79	5	0	82	576	107	5.6	0.2	0.13	37	1140	637
8-20-63				7.63	5.10	3.43	0.13		1.34	11.99	3.02	0.09					
				47	31	21	1		8	73	18	1				1065	
10S/ 3W-16F 8 S	66	7.2	2200	238	158	160	7	0	177	1124	191	3.6	0.2	0.25	31	2162	1244
10-25-63				11.88	12.99	6.96	0.18		2.90	23.40	5.39	0.06					
				37	41	22	1		9	74	17					2000	
10S/ 3W-16F 9 S	69	6.9	1980	265	92	80	7	0	113	969	81	0	0.5	0.21	30		1040
11-16-60				13.22	7.57	3.48	0.18		1.85	20.17	2.28					1696	
				54	31	14	1		8	83	9					1580	
10S/ 3W-16F10 S	70	7.2	2152	217	106	124	6	0	231	790	173	4.0	0.5	0.29	29		978
11-16-60				10.83	8.72	5.39	0.15		3.79	16.45	4.88	0.06				1668	
				43	35	21	1		15	65	19					1563	
10S/ 3W-16J 4 S	69	7.4	1830	156	61	175	6	0	300	427	231	0	0.2	0.19	25	1106	641
8-20-63				7.78	5.02	7.61	0.15		4.92	8.89	6.51						
				38	24	37	1		24	44	32					1229	
10S/ 3W-20A 2 S	69	7.2	1950	145	96	160	7	0	264	538	221	34	0.2	0.21	32	1470	758
8-20-63				7.24	7.90	6.96	0.18		4.33	11.20	6.23	0.55					
				32	35	31	1		19	50	28	2				1363	
10S/ 3W-20D 1 S	73	7.4	680	40	18	79	3	0	170	33	99	35	0.2	0.11	34	408	174
8-20-63				2.00	1.48	3.43	0.08		2.79	0.69	2.79	0.56					
				29	21	49	1		41	10	41	8				425	
10S/ 3W-20E 1 S	65	7.5	1660	128	57	164	5	0	342	363	195	0	0.6	0.19	24		554
11- 3-60				6.39	4.69	7.13	0.13		5.61	7.56	5.50					1126	
				35	26	39	1		30	40	29					1105	
10S/ 3W-20P 3 S	--	7.5	2150	249	41	300	4	0	491	532	363	0	0.4	0.20	28	1820	791
10-25-63				12.43	3.37	13.04	0.10		8.05	11.08	10.24						
				43	12	45			27	38	35					1759	
10S/ 3W-20P 4 S	--	8.4	--	118	78	302	6	16	361	430	332	0	0.4	--	--		615
1- 3-61				5.89	6.41	13.13	0.15	0.53	5.92	8.95	9.36						
				23	25	51	1	2	24	36	38					1460	
10S/ 3W-29C 1 S	--	7.7	4000	235	137	428	4	0	503	284	945	37	0.2	0.32	29	2708	1151
7-20-63				11.73	11.27	18.61	0.10		8.24	5.91	26.65	0.60					
				28	27	45			20	14	64	1				2347	
10S/ 3W-29C 2 S	69	7.1	2453	164	57	248	6	0	5	229	475	0	0.3	0.04	29	1684	644
8- 3-59				8.18	4.69	10.78	0.15		0.08	4.77	13.40						
				34	20	45	1			26	73					1211	
10S/ 3W-29E 1 S	--	7.6	2235	174	70	210	9	0	421	392	304	0	0.6	0.36	26		723
11- 3-60				8.68	5.76	9.13	0.23		6.90	8.16	8.57					1470	
				36	24	38	1		29	35	36					1393	
10S/ 3W-31F 2 S	70	6.8	1754	--	--	--	--	--	188	--	306	--	--	--	--		646
6-28-56									3.08		8.63						
10S/ 3W-31F 3 S	--	7.0	1950	118	61	186	7	0	225	280	351	0	0.6	0.17	24	1206	546
6-25-57				5.89	5.02	8.09	0.18		3.69	5.83	9.90						
				31	26	42	1		19	30	51					1138	

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
BONSALL HYDRO SUBUNIT				203A0	SAN LUIS REY HYDRO UNIT						20300						
10S/ 3W-31P 1 S	--	7.5	2080	251	10	200	10	0	57	590	310	0	1.0	0	[illegible]	1440	668
4-26-62				12.52	0.82	8.70	0.26		0.93	12.28	8.74						
				56	4	39	1		4	56	40					1409	
10S/ 3W-32R 1 S	--	7.1	1280	92	41	113	--	0	259	93	221	--	--	0.40	47	820	378
11-13-62				4.59	3.37	4.91			4.25	1.94	6.23						
10S/ 3W-36N 1 S	--	7.2	2030	154	52	187	--	0	378	206	342	--	--	0.20	46	1276	578
10-16-62				7.68	4.28	8.13			6.20	4.29	9.64						
10S/ 4W- 1R 1 S	--	7.2	1037	59	51	90	4	0	159	209	131	20	0.3	0.08	55	780	357
6-17-64				2.94	4.19	3.91	0.10		2.61	4.35	3.69	0.32					
				26	38	35	1		24	40	34	3				697	
10S/ 4W-27J 1 S	--	7.7	1050	49	38	103	11	0	201	27	209	15	0.5	0.04	31	589	279
2-10-60				2.45	3.13	4.48	0.28		3.29	0.56	5.89	0.24					
				24	30	43	3		33	6	59	2				582	
10S/ 4W-33G 1 S	--	7.8	1174	69	34	115	10	0	210	45	253	4.1	0.5	0.31	29	740	31.
9-27-63				3.44	2.80	5.00	0.26		3.44	0.94	7.13	0.07					
				30	24	43	2		30	8	62	1				663	
10S/ 4W-33M 1 S	70	7.9	1718	41	32	285	2	0	325	83	349	1.0	0.8	0.24	28	935	234
10- 5-61				2.05	2.63	12.39	0.05		5.33	1.73	9.84	0.02					
				12	15	72			32	10	58					982	
10S/ 4W-35N 1 S	--	7.5	930	55	26	98	8	0	202	32	179	7.5	0.2	0.15	25	638	244
10-15-63				2.74	2.14	4.26	0.20		3.31	0.67	5.05	0.12					
				29	23	46	2		36	7	55	1				530	
10S/ 4W-35P 1 S	--	7.9	980	39	12	160	3	0	198	36	204	0	0.1	0.33	25	566	147
10-15-63				1.95	0.99	6.96	0.08		3.25	0.75	5.75						
				20	10	70	1		33	8	59					577	
10S/ 4W-35R 1 S	68	7.6	1560	100	57	149	6	0	253	156	310	0	0.5	0.01	47		484
12- 5-56				4.99	4.69	6.48	0.15		4.15	3.25	8.74					1050	
				31	29	40	1		26	20	54					950	
10S/ 4W-35R 2 S	71	7.4	1650	136	60	180	8	0	221	288	360	1.3	0.1	0.17	11	1312	586
10- 5-61				6.79	4.93	7.83	0.20		3.62	6.00	10.15	0.02					
				34	25	40	1		18	30	51					1153	
10S/ 4W-35R 3 S	70	7.0	1930	181	52	177	9	0	220	331	378	5.3	0.2	0.21	20	1482	666
10-15-63				9.03	4.28	7.70	0.23		3.61	6.89	10.66	0.09					
				43	20	36	1		17	32	50					1262	
11S/ 1W- 7L 1 S	72	8.2	450	27	10	59	2	0	191	16	40	10	0.2	0.07	--	295	109
6-17-64				1.35	0.82	2.57	0.05		3.13	0.33	1.13	0.16					
				28	17	54	1		66	7	24	3				258	
11S/ 1W- 7P 1 S	70	7.4	585	38	20	54	3	0	205	40	53	20	0.2	0.10	--	368	177
6-17-64				1.90	1.64	2.35	0.08		3.36	0.83	1.49	0.32					
				32	27	39	1		56	14	25	5				329	
11S/ 1W-16B 2 S	70	7.9	495	33	12	56	2	0	189	17	49	18	0.2	0.10	--	310	132
6-17-64				1.65	0.99	2.43	0.05		3.10	0.35	1.38	0.29					
				32	19	47	1		61	7	27	6				280	
11S/ 1W-22E 1 S	66	8.1	730	41	25	74	2	--	239	43	73	31	0.2	0.10	--	436	206
6-17-64				2.05	2.06	3.22	0.05		3.92	0.90	2.06	0.50					
				28	28	44	1		53	12	28	7				407	
11S/ 1W-22E 2 S	70	8.3	600	33	19	67	2	5	220	33	53	21	0.2	0.10	--	354	161
6-17-64				1.65	1.56	2.91	0.05	0.17	3.61	0.69	1.49	0.34					
				27	25	47	1	3	57	11	24	5				341	
11S/ 2W-13R 1 S	--	7.5	1451	84	60	140	2	0	388	75	246	36	0.5	0.04	43	920	456
6-17-64				4.19	4.93	6.09	0.05		6.36	1.56	6.94	0.58					
				27	32	40			41	10	45	4				677	
11S/ 4W- 1L 1 S	66	7.3	2049	115	88	184	8	0	410	158	384	19	0.4	0.31	39	1285	650
2-11-60				5.74	7.24	8.00	0.20		6.72	3.29	10.83	0.31					
				27	34	38	1		32	16	51	1				1197	
11S/ 4W- 1L 2 S	66	7.8	2317	118	98	227	5	--	405	242	427	10	0.5	0.21	45	1456	698
2-11-60				5.89	8.06	9.87	0.13		6.64	5.04	12.04	0.16					
				25	34	41	1		28	21	50	1				1372	
11S/ 4W- 2D 1 S	66	7.5	2300	185	74	185	6	0	317	224	474	5	0.2	0.25	20	1462	767
11-30-62				9.23	6.09	8.04	0.15		5.20	4.66	13.37	0.08					
				39	26	34	1		22	20	57					1329	
11S/ 4W- 2D 2 S	73	7.5	1770	138	52	170	8	0	314	192	340	3.8	0.4	0.17	12	1196	559
9-25-61				6.89	4.28	7.39	0.20		5.15	4.00	9.59	0.06					
				37	23	39	1		27	21	51					1071	
11S/ 4W- 2D 5 S	--	--	808	--	--	--	--	--	--	--	103	--	--	--	--		
6-27-58											2.90						

SAN LUIS REY HYDRO UNIT 20300

BONSALL HYDRO SUBUNIT 203A0

State well number Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C Evap 105°C Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million equivalents per million percent reactance value									Chemical constituents in parts per million				
11S/ 4W- 20 6 S 7- 0-58	--	--	1180	--	--	--	--	--	--	--	146 4.12	--	--	--	--		
11S/ 4W- 2G 1 S 10- 8-59	72	7.6	3257	184 9.18 27	136 11.18 33	312 13.57 40	3 0.08	0	386 6.33 19	182 3.79 11	815 22.98 69	3.5 0.06	0.8	0.12	40	2390 1866	1019
11S/ 4W- 2G 2 S 6-27-58	--	--	3218	--	--	--	--	--	--	--	817 23.04	--	--	--	--		
11S/ 4W- 2G 4 S 9-25-61	70	7.2	2864	213 10.63 36	73 6.00 20	305 13.26 44	1 0.03	0	432 7.08 24	187 3.89 13	650 18.33 62	3.7 0.06	0.4	0.20	17	1665 1663	832
11S/ 4W- 2K 1 S 10- 2-61	69	6.8	3750	259 12.92 32	163 13.41 34	310 13.48 34	1 0.03	0	452 7.41 19	262 5.45 14	913 25.75 67	2.3 0.04	0.1	0.30	38	1778 2171	1318
11S/ 4W- 2K 2 S 9-25-61	70	7.1	2700	138 6.89 25	92 7.57 27	305 13.26 48	1 0.03	0	431 7.06 26	223 4.64 17	562 15.85 57	1.0 0.02	0.1	0.30	46	1710 1580	724
11S/ 4W- 2L 1 S 10-15-63	67	6.9	3550	271 13.52 33	141 11.60 29	350 15.22 38	4 0.10	0	360 5.90 15	209 4.35 11	1060 29.89 74	3.1 0.05	0.2	0.30	44	2614 2260	1257
11S/ 4W- 3C 1 S 10- 8-59	--	8.2	1900	131 6.54 33	65 5.35 27	175 7.61 39	7 0.18 1	17 0.57 3	329 5.39 28	130 2.71 14	376 10.60 55	2.5 0.04	0.3	0.18	20	1190 1086	595
11S/ 4W- 3C 2 S 10-15-63	72	7.4	1920	227 11.33 55	3 0.25 1	200 8.70 43	7 0.18 1	0	231 3.79 20	71 1.48 8	489 13.79 72	4.0 0.06	0.2	0.27	21	1438 1136	579
11S/ 4W- 3G 2 S 10-28-58	65	7.3	1172	92 4.59 37	38 3.13 25	105 4.57 37	5 0.13 1	--	229 3.75 30	142 2.96 24	203 5.72 46	6.0 0.10 1	0.6	0.06	30	755 734	386
11S/ 4W- 3H 3 S 10-15-63	67	7.4	2330	286 14.27 56	28 2.30 9	200 8.70 34	8 0.20 1	0	314 5.15 21	240 5.00 20	525 14.81 59	4.9 0.08	0.2	0.18	20	1702 1467	829
11S/ 4W- 3H 4 S 10-15-63	68	7.3	6250	381 19.01 26	198 16.28 22	850 36.96 51	15 0.38 1	0	386 6.33 9	585 12.18 17	1865 52.59 74	0	0.1	0.46	25	5230 4109	1766
11S/ 4W- 3K 1 S 10-21-57	69	8.2	3290	34 1.70 6	25 2.06 7	575 25.00 85	22 0.56 2	0	664 10.88 33	238 4.96 15	625 17.63 53	0	0.1	0	7	2465 1853	188
11S/ 4W- 4G 2 S 10- 5-61	72	8.0	2200	172 8.58 38	58 4.77 21	214 9.30 41	1 0.03	0	299 4.90 22	159 3.31 15	468 13.20 59	68 1.10 5	0.1	0.30	24	1718 1311	668
11S/ 4W- 4H 1 S 10-29-58	66	8.1	2155	94 4.69 22	48 3.95 19	283 12.30 58	5 0.13 1	0	205 3.36 16	156 3.25 15	510 14.38 68	2 0.03	0.9	0.20	16	1414 1216	432
11S/ 4W- 4J 1 S 6-20-58	--	7.6	2640	160 7.98 28	124 10.20 36	242 10.52 37	--	--	264 4.33 18	285 5.93 24	500 14.10 58	0.2	0.2	2.00	40	1850 1483	910
11S/ 4W- 4J 2 S 11-18-63	--	7.5	3300	234 11.68 30	126 10.36 27	380 16.52 43	8 0.20 1	0	267 4.38 12	296 6.16 17	943 26.59 71	7.0 0.11	0.4	0.29	19	2538 2145	1103
11S/ 4W- 4K 1 S 9-27-61	68	8.0	2000	148 7.39 35	52 4.28 20	213 9.26 44	7 0.18 1	0	238 3.90 19	169 3.52 17	479 13.51 64	6.2 0.10	0.2	0.15	18	1436 1210	584
11S/ 4W- 4K 3 S 10-29-58	70	7.7	3237	232 11.58 33	124 10.20 29	300 13.04 37	2 0.05	--	325 5.33 15	290 6.04 17	800 22.56 64	69 1.11 3	0.2	0.12	40	2208 2017	1090
11S/ 4W- 4M 1 S 10-11-63	--	8.2	1320	147 7.34 55	13 1.07 8	110 4.78 36	2 0.05	0	259 4.25 33	107 2.23 17	216 6.09 47	26 0.42 3	0.2	0.18	31	850 780	421
11S/ 4W- 4M 2 S 10-29-58	68	7.3	879	--	--	--	--	--	198 3.25	--	144 4.06	--	--	--	--		268
11S/ 4W- 4N 1 S 9-28-61	72	8.1	1480	130 6.49 42	43 3.54 23	118 5.13 34	5 0.13 1	0	308 5.05 34	123 2.56 17	249 7.02 47	24 0.39 3	0.2	0.18	25	940 869	502
11S/ 4W- 4P 2 S 10-24-63	--	7.3	1650	208 10.38 63	11 0.90 5	120 5.22 31	3 0.08	0	205 3.36 21	138 2.87 18	308 8.69 54	82 1.32 8	0.2	0.18	28	1148 999	564

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C Evap 105°C Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million, equivalents per million, percent reactance value									Chemical constituents in parts per million				
BONSALL HYDRO SUBUNIT 203A0				SAN LUIS REY HYDRO UNIT 20300													
11S/ 4W- 4Q 2 S	68	7.6	2000	145	45	205	8	0	239	161	435	12	0.2	0.26	20	1342	547
9-28-61				7.24	3.70	8.91	0.20		3.92	3.35	12.27	0.19					
				36	18	44	1		20	17	62	1				1149	
11S/ 4W- 4Q 3 S	--	--	1989	--	--	--	--	--	--	--	440	--	--	--	--		
6-27-58											12.41						
11S/ 4W- 4R 1 S	66	7.7	4566	356	145	525	12	--	317	363	1410	0	0.5	0.18	25	3910	1485
10-28-58				17.76	11.92	22.83	0.31		5.20	7.56	39.76						
				34	23	43	1		10	14	76					2992	
11S/ 4W- 4R 3 S	--	8.0	2527	167	71	240	--	12	235	200	572	3	--	--	--	714	709
7- 0-58				8.33	5.84	10.44		0.40	3.85	4.16	16.13	0.05					
				34	24	42		2	16	17	66					1381	
11S/ 4W- 5K 2 S	68	7.3	922	75	29	84	6	0	212	57	184	0	0.6	0.08	25	646	306
3-27-59				3.74	2.38	3.65	0.15		3.47	1.19	5.19						
				38	24	37	2		35	12	53					565	
11S/ 4W- 5K 5 S	65	7.9	876	69	27	88	6	--	271	72	123	2.0	0.7	0.04	30	515	283
10-28-58				3.44	2.22	3.83	0.15		4.44	1.50	3.47	0.03					
				36	23	40	2		47	16	37					551	
11S/ 4W- 5K 6 S	--	7.5	783	59	22	68	5	0	244	57	96	1.4	0.5	0.01	30	462	238
3-16-60				2.94	1.81	2.96	0.13		4.00	1.19	2.71	0.02					
				38	23	38	2		51	15	34					459	
11S/ 4W- 5L 1 S	--	7.7	2151	181	71	158	9	0	312	113	500	5.0	0.5	0.16	30	1580	744
9-26-63				9.03	5.84	6.87	0.23		5.11	2.35	14.10	0.08					
				41	27	31	1		24	11	65					1221	
11S/ 4W- 5Q 1 S	66	7.4	1000	74	32	95	5	0	193	81	137	7.5	0.5	0.12	29	625	316
9-26-63				3.69	2.63	4.13	0.13		3.16	1.69	3.86	0.12					
				35	25	39	1		36	19	44	1				556	
11S/ 4W- 5Q 4 S	69	7.7	1371	106	48	117	7	0	381	128	173	48	0.4	0.08	30	810	462
9-27-61				5.29	3.95	5.09	0.18		6.24	2.66	4.88	0.77					
				36	27	35	1		43	18	34	5				845	
11S/ 4W- 5R 1 S	--	7.4	1059	78	31	94	5	--	292	84	138	6.7	0.4	0.08	30	601	322
2-10-60				3.89	2.55	4.09	0.13		4.79	1.75	3.89	0.11					
				36	24	38	1		45	17	37	1				611	
11S/ 4W- 6R 1 S	70	8.7	3291	228	100	316	11	0	452	295	700	0	0.1	0.30	15	2105	981
11-25-57				11.38	8.22	13.74	0.28		7.41	6.14	19.74						
				34	24	41	1		22	18	59					1888	
11S/ 4W- 6R 2 S	72	8.0	2150	134	30	275	3	0	187	210	481	0	1.0	2.10	20	1462	458
9-27-61				6.69	2.47	11.96	0.08		3.06	4.37	13.56						
				32	12	56			15	21	65					1248	
11S/ 4W- 6R 4 S	--	7.4	4662	302	106	585	12	0	547	378	1140	2.5	0.5	0.56	29	3120	1190
9-26-63				15.07	8.72	25.44	0.31		8.97	7.87	32.15	0.04					
				30	18	51	1		18	16	66					2824	
11S/ 4W- 7J 1 S	68	7.7	2356	179	64	209	9	0	276	270	466	0.5	0.4	0.10	32	1549	710
9-26-61				8.93	5.26	9.09	0.23		4.52	5.62	13.14	0.01					
				38	22	39	1		19	24	56					1366	
11S/ 4W- 7J 2 S	--	8.0	1013	69	27	92	--	12	201	100	142	0	0	--	--	285	283
7- 0-58				3.44	2.22	4.00		0.40	3.29	2.08	4.00						
				36	23	41		4	34	21	41					541	
11S/ 4W- 7L 1 S	68	8.0	1820	37	35	305	13	0	104	264	379	6.5	0.6	1.40	1	1202	237
11-18-63				1.85	2.88	13.26	0.33		1.70	5.50	10.69	0.10					
				10	16	72	2		9	31	59	1				1094	
11S/ 4W- 7L 2 S	68	7.8	2420	133	91	290	10	0	292	398	482	0	0.4	0.54	13	1654	707
11-18-63				6.64	7.48	12.61	0.26		4.79	8.29	13.59						
				25	28	47	1		18	31	51					1561	
11S/ 4W- 7N 1 S	68	7.3	1488	83	51	146	12	0	268	45	332	29	0.2	0.10	4	870	417
3- 2-64				4.14	4.19	6.35	0.31		4.39	0.94	9.36	0.47					
				28	28	42	2		29	6	62	3				834	
11S/ 4W- 7P 1 S	67	7.5	1700	168	46	136	--	--	256	192	350	0.1	0.2	2.00	30	1180	608
11- 4-58				8.38	3.78	5.91			4.20	4.00	9.87						
				46	21	33			23	22	55					1050	
11S/ 4W- 7P 2 S	68	7.9	1282	95	36	112	6	0	270	135	207	0	0.2	0	17	884	385
10-30-58				4.74	2.96	4.87	0.15		4.43	2.81	5.84						
				37	23	38	1		34	21	45					741	
11S/ 4W- 7Q 1 S	--	7.8	1351	99	57	110	--	--	290	170	206	0	--	--	--	485	482
7- 0-58				4.94	4.69	4.78			4.75	3.54	5.81						
				34	33	33			34	25	41					785	
11S/ 4W- 7Q 2 S	67	7.7	1617	128	47	134	7	0	270	188	272	1.2	0.5	0.09	33	1004	513
1- 8-63				6.39	3.87	5.83	0.18		4.43	3.91	7.67	0.02					
				39	24	36	1		28	24	48					943	

SAN LUIS REY HYDRO UNIT Z0300

BONSALL HYDRO SUBUNIT Z03A0

State well number Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C Evap 105°C Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
11S/ 4W- 7R 2 S 9-26-63	--	7.4	1326	94 4.69 34	33 2.71 20	141 6.13 45	6 0.15 1	0	260 4.26 32	144 3.00 23	208 5.87 45	1.1 0.02	0.5	0.13	28	864 784	370
11S/ 4W- 8B 1 S 10-11-63	--	7.8	1330	103 5.14 37	31 2.55 18	140 6.09 44	6 0.15 1	0	283 4.64 34	158 3.29 24	206 5.81 42	1.8 0.03	0.1	0.27	26	864 811	385
11S/ 4W- 8B 3 S 9-28-61	74	7.9	1712	128 6.39 36	54 4.44 25	154 6.70 38	8 0.20 1	0	339 5.56 31	189 3.93 22	291 8.21 46	0.5 0.01	0.4	0.08	30	1010 1022	542
11S/ 4W- 8C 3 S 9-27-61	68	8.1	2100	180 8.98 41	67 5.51 25	170 7.39 34	6 0.15 1	0	302 4.95 23	190 3.96 18	452 12.75 59	0	0.3	0.18	21	1600 1235	725
11S/ 4W- 8E 1 S 10-25-63	--	8.0	1650	187 9.33 54	24 1.97 11	134 5.83 34	7 0.18 1	0	292 4.79 28	179 3.73 21	314 8.85 51	0	0.1	0.12	25	1198 1014	565
11S/ 4W- 8E 2 S 9-25-63	76	7.7	1721	149 7.44 41	55 4.52 25	135 5.87 33	8 0.20 1	0	312 5.11 29	184 3.83 21	314 8.85 50	2.5 0.04	0.5	0.12	28	1150 1030	598
11S/ 4W- 8H 1 S 9-25-63	--	7.6	2874	195 9.73 32	89 7.32 24	308 13.39 44	9 0.23 1	0	380 6.23 21	363 7.56 25	565 15.93 54	2.2 0.04	0.6	0.12	26	1895 1745	853
11S/ 4W- 8J 1 S 9-28-61	72	7.8	3270	209 10.43 31	95 7.81 24	341 14.83 45	6 0.15	0	368 6.03 19	270 5.62 17	728 20.53 63	13 0.21 1	0.5	0.21	33	2105 1877	913
11S/ 4W- 8J 2 S 10- 4-61	74	7.2	2440	154 7.68 30	74 6.09 23	270 11.74 45	18 0.46 2	0	351 5.75 22	280 5.83 23	496 13.99 54	10 0.16 1	0.1	0.30	27	1286 1502	689
11S/ 4W- 8J 3 S 4-10-62	70	7.3	7900	546 27.25 30	176 14.47 16	1100 47.83 53	13 0.33	0	375 6.15 7	1156 24.07 27	2137 60.26 67	0	0.1	0.57	29	5864 5342	2088
11S/ 4W- 8K 1 S 9-26-63	--	7.3	1499	160 7.98 52	19 1.56 10	128 5.57 37	4 0.10 1	0	249 4.08 27	123 2.56 17	280 7.90 53	30 0.48 3	0.4	0.52	36	1080 903	477
11S/ 4W- 8L 1 S 9-26-63	--	7.3	1869	141 7.04 36	56 4.61 23	180 7.83 40	6 0.15 1	0	398 6.52 33	158 3.29 17	314 8.85 45	50 0.81 4	0.4	0.18	32	1175 1133	583
11S/ 4W- 8L 2 S 9-26-63	--	7.2	2331	176 8.78 35	81 6.66 26	220 9.57 38	7 0.18 1	0	432 7.08 28	280 5.83 23	405 11.42 46	35 0.56 2	0.5	0.42	37	1620 1454	773
11S/ 4W- 8L 3 S 9-26-63	--	7.7	1736	113 5.64 32	29 2.38 14	215 9.35 54	3 0.08	0	261 4.28 25	170 3.54 20	334 9.42 55	2.5 0.04	0.6	0.24	24	1095 1020	401
11S/ 4W- 8M 1 S 9-26-63	--	7.6	1761	144 7.19 39	54 4.44 24	155 6.74 36	8 0.20 1	0	295 4.84 26	260 5.41 29	290 8.18 44	2.5 0.04	0.6	0.12	26	1190 1085	582
11S/ 4W- 8N 1 S 11-28-62	--	7.5	2720	227 11.33 38	60 4.93 17	310 13.48 45	2 0.05	0	321 5.26 17	256 5.33 18	692 19.51 65	0	0.4	0.41	20	1814 1726	814
11S/ 4W- 8N 2 S 10-24-63	--	7.7	2360	210 10.48 41	23 1.89 7	295 12.83 51	3 0.08	0	322 5.28 21	173 3.60 14	575 16.22 65	0	0.2	0.30	21	1582 1459	619
11S/ 4W- 8N 3 S 4-10-62	--	7.5	1725	136 6.79 39	50 4.11 24	145 6.30 36	6 0.15 1	0	287 4.70 27	205 4.27 24	301 8.49 49	0	0.4	0.17	19	1050 1004	545
11S/ 4W- 8R 1 S 10- 3-61	--	7.5	3796	264 13.17 33	106 8.72 22	410 17.83 45	6 0.15	0	339 5.56 14	300 6.25 16	975 27.50 70	14 0.23 1	0.6	0.24	29	2330 2271	1095
11S/ 4W- 8R 2 S 10-21-57	--	7.3	1381	100 4.99 35	38 3.13 22	134 5.83 41	5 0.13 1	0	183 3.00 21	336 7.00 48	160 4.51 31	0.0	0.4	0.19	10	862 873	406
11S/ 4W- 9B 1 S 8- 0-54	--	--	1831	--	--	--	--	--	--	--	284 8.01	--	--	--	--		
11S/ 4W- 9C 1 S 10-29-58	66	7.8	1229	93 4.64 37	34 2.80 23	111 4.83 39	6 0.15 1	--	303 4.97 40	97 2.02 16	194 5.47 44	6.8 0.11 1	0.2	0.07	30	745 721	372
11S/ 4W- 9F 1 S 10-25-63	68	7.3	3700	307 15.32 38	96 7.90 20	389 16.91 42	7 0.18	0	467 7.65 19	327 6.81 17	901 25.41 64	0	0.2	0.39	28	2496 2285	1162

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C Evap 105°C Computed	Total hardness as $CaCO_3$
							SAN LUIS REY HYDRO UNIT				20300						
BONSALL HYDRO SUBUNIT				203A0													
11S/ 4W- 9G 1 S	70	7.6	3400	214	101	400	5	0	449	297	796	0	0.2	0.41	25	2310	950
9-25-61				10.68	8.31	17.39	0.13		7.36	6.18	22.50						
				29	23	48			20	17	62					2061	
11S/ 4W- 9H 1 S	68	7.7	8640	281	223	1251	5	0	384	608	2363	0	0.3	0.20	16	5750	1619
10-22-57				14.02	18.34	54.39	0.13		6.29	12.66	66.64						
				16	21	63			7	15	78					4936	
11S/ 4W- 9H 2 S	74	7.9	4914	191	102	700	4	0	220	331	1370	2.5	0.8	0.76	24	3030	897
9-25-61				9.53	8.39	30.44	0.10		3.61	6.89	38.63	0.04					
				20	17	63			7	14	79					2834	
11S/ 4W- 9L 1 S	69	7.7	10600	567	413	2570	1	0	502	6791	771	0	1.0	1.95	7	11918	3115
11-18-63				28.29	33.97	111.74	0.03		8.23	141.39	21.74						
				16	20	64			5	83	13					11370	
11S/ 4W- 9N 1 S	--	7.6	1400	79	21	217	2	0	334	19	312	9.1	0.8	0.39	22	872	284
11-18-63				3.94	1.73	9.44	0.05		5.47	0.40	8.80	0.15					
				26	11	62			37	3	59	1				846	
11S/ 4W- 9P 1 S	--	--	878	82	28	83	--	--	293	83	124	--	--	--	--		320
10- 0-54				4.09	2.30	3.61			4.80	1.73	3.50						
11S/ 4W-10B 1 S	70	7.8	2010	145	33	200	4	0	142	36	530	26	0.4	0.14	50	1580	498
10- 8-59				7.24	2.71	8.70	0.10		2.33	0.75	14.95	0.42					
				39	14	46	1		13	4	81	2				1094	
11S/ 4W-11K 1 S	--	7.0	2610	182	54	256	2	0	166	21	758	4.0	0.8	0.14	5	2080	677
10- 8-59				9.08	4.44	11.13	0.05		2.72	0.44	21.38	0.06					
				37	18	45			11	2	87					1365	
11S/ 4W-12E 1 S	--	6.9	4200	285	113	430	2	0	508	96	1115	0	0.6	0.48	50	3175	1176
10- 8-59				14.22	9.29	18.70	0.05		8.33	2.00	31.44						
				34	22	44			20	5	75					2342	
11S/ 4W-17B 1 S	--	--	2065	--	--	--	--	--	--	--	451	--	--	--	--		
6-27-58											12.72						
11S/ 4W-17Q 1 S	--	7.1	2125	150	57	185	1	0	384	37	475	1.6	0.2	0.25	31	1295	609
12-20-57				7.49	4.69	8.04	0.03		6.29	0.77	13.40	0.03					
				37	23	40			31	4	65					1127	
11S/ 4W-18B 1 S	68	8.1	1140	94	28	115	3	0	279	119	192	0	0.3	0.18	23	842	350
10- 4-61				4.69	2.30	5.00	0.08		4.57	2.48	5.41						
				39	19	41	1		37	20	43					712	
11S/ 4W-18C 1 S	--	7.4	1608	126	52	146	7	0	287	193	271	0.5	0.4	0.12	28	1048	529
9-25-63				6.29	4.28	6.35	0.18		4.70	4.02	7.64	0.01					
				37	25	37	1		29	25	47					965	
11S/ 4W-18C 3 S	--	--	2101	168	47	200	--	--	262	346	337	--	--	--	--		613
8-10-54				8.38	3.87	8.70			4.29	7.20	9.50						
11S/ 4W-18C 4 S	--	7.4	2439	204	76	230	10	0	329	407	434	3.7	0.6	0.15	30	1810	822
9-27-63				10.18	6.25	10.00	0.26		5.39	8.47	12.24	0.06					
				38	23	37	1		21	32	47					1557	
11S/ 4W-18C 5 S	--	7.3	2310	195	71	214	9	0	322	344	426	3.7	0.5	0.14	31	1645	779
9-27-63				9.73	5.84	9.30	0.23		5.28	7.16	12.01	0.06					
				39	23	37	1		22	29	49					1453	
11S/ 4W-18C 6 S	70	7.5	2650	266	29	275	9	0	318	372	514	0	0.1	0.27	17	1728	783
10-11-63				13.27	2.38	11.96	0.23		5.21	7.75	14.49						
				48	9	43	1		19	28	53					1639	
11S/ 4W-18C 7 S	--	--	2387	--	--	--	--	--	--	--	405	--	--	--	--		
6-27-58											11.42						
11S/ 4W-18C 8 S	68	7.9	2500	220	77	250	8	0	306	305	599	0	0.2	0.23	22	2012	866
11-28-62				10.98	6.33	10.87	0.20		5.05	6.35	16.89						
				39	22	38	1		18	22	60					1633	
11S/ 4W-18C 9 S	--	7.6	2387	206	74	210	9	0	332	331	454	3.7	0.4	0.21	31	1685	819
9-27-63				10.28	6.09	9.13	0.23		5.44	6.89	12.80	0.06					
				40	24	35	1		22	27	51					1483	
11S/ 4W-18E 1 S	70	7.0	1240	40	19	207	1	0	89	114	303	7.5	0.1	0.12	2	878	178
10-11-63				2.00	1.56	9.00	0.03		1.46	2.37	8.54	0.12					
				16	12	71			12	19	68	1				737	
11S/ 4W-18F 1 S	68	7.5	2660	132	132	277	10	0	354	473	505	2.5	0.4	0.26	23	1845	873
3-13-64				6.59	10.86	12.04	0.26		5.80	9.85	14.24	0.04					
				22	37	40	1		19	33	48					1729	
11S/ 4W-18G 2 S	68	7.4	2516	196	79	207	8	0	317	382	452	1.1	0.5	0.12	33	1751	815
1- 8-63				9.78	6.50	9.00	0.20		5.20	7.95	12.75	0.02					
				38	26	35	1		20	31	49					1515	

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
BONSALL HYDRO SUBUNIT				Z03A0			SAN LUIS REY HYDRO UNIT				20300						
11S/ 4W-18G 6 S	--	--	1884	--	--	--	--	--	--	--	231	--	--	--	--		
6-27-58											6.51						
11S/ 4W-18L 1 S	--	7.8	--	204	72	198	5	--	283	487	345	0.1	0.1	--	--		806
8-15-60				10.18	5.92	8.61	0.13		4.64	10.14	9.73						
				41	24	35	1		19	41	40					1450	
11S/ 4W-18L 2 S	--	7.7	2049	163	62	185	8	0	351	205	390	3.7	0.4	0.17	30	1390	662
9-27-63				8.13	5.10	8.04	0.20		5.75	4.27	11.00	0.06					
				38	24	37	1		27	20	52					1220	
11S/ 4W-18L 3 S	68	7.2	2325	313	53	213	7	0	337	655	343	0	0.2	0.23	23	1868	1000
11-26-62				15.62	4.36	9.26	0.18		5.52	13.64	9.67						
				53	15	31	1		19	47	34					1773	
11S/ 4W-18L 4 S	--	7.4	1280	108	43	105	6	0	293	157	188	0.5	0.5	0.11	30	900	447
9-27-63				5.39	3.54	4.57	0.15		4.80	3.27	5.30	0.01					
				39	26	33	1		36	24	40					782	
11S/ 4W-18L 7 S	68	7.4	2012	177	74	144	8	0	320	415	255	1.5	0.5	0.10	29	1282	747
9-26-61				8.83	6.09	6.26	0.20		5.24	8.64	7.19	0.02					
				41	28	29	1		25	41	34					1261	
11S/ 5W-13B 1 S	64	7.3	2800	128	72	355	2	0	264	181	701	0	0.4	0.23	21	1736	616
9-28-61				6.39	5.92	15.44	0.05		4.33	3.77	19.77						
				23	21	56			16	14	71					1590	
11S/ 5W-13B 2 S	--	7.4	2053	93	55	262	3	0	244	120	478	2.5	0.7	0.16	22	1250	458
9-26-63				4.64	4.52	11.39	0.08		4.00	2.50	13.48	0.04					
				22	22	55			20	12	67					1156	
11S/ 5W-13L 1 S	--	7.7	3135	294	127	240	10	0	344	547	665	1.2	0.4	0.12	29	2320	1257
3- 3-64				14.67	10.44	10.44	0.26		5.64	11.39	18.75	0.02					
				41	29	29	1		16	32	52					2083	
11S/ 5W-13L 2 S	64	7.3	17730	261	800	3050	18	0	81	2056	5975	6.2	0.6	0.96	3	13340	3944
3- 2-64				13.02	65.79	132.61	0.46		1.33	42.81	168.50	0.10					
				6	31	63			1	20	79					12211	
11S/ 5W-13N 2 S	67	7.6	1667	32	40	236	13	0	173	192	310	6	0.3	0.16	--	933	245
3-12-64				1.60	3.29	10.26	0.33		2.84	4.00	8.74	0.10					
				10	21	66	2		18	26	56	1				914	
11S/ 5W-13N 3 S	--	8.0	7000	212	162	1227	2	0	123	53	2598	0	0.2	0.22	1	4962	1196
11-18-63				10.58	13.32	53.35	0.05		2.02	1.10	73.26						
				14	17	69			3	1	96					4316	
11S/ 5W-13P 1 S	70	6.6	15200	389	361	2750	33	0	50	304	5670	0	0.1	0.40	3	11480	2457
10-10-63				19.41	29.69	119.57	0.84		0.82	6.33	159.89						
				11	18	71				4	96					9535	
11S/ 5W-13P 2 S	68	7.1	15460	326	410	2630	47	0	43	316	5625	21	0.6	1.00	--	9845	2501
3-12-64				16.27	33.72	114.35	1.20		0.70	6.58	158.63	0.34					
				10	20	69	1			4	95					9398	
11S/ 5W-13Q 1 S	64	6.9	6313	478	207	545	16	0	292	317	1840	1	0.4	0.10	30	4730	2045
9-27-61				23.85	17.02	23.70	0.41		4.79	6.60	51.89	0.02					
				37	26	36	1		8	10	82					3578	
11S/ 5W-13Q 3 S	--	7.0	10893	670	317	1440	22	0	256	535	3800	5.0	0.4	0.22	26	8000	2977
3- 2-64				33.43	26.07	62.61	0.56		4.20	11.14	107.16	0.08					
				27	21	51			3	9	87					6941	
11S/ 5W-14Q 1 S	--	6.4	9094	321	214	1288	35	0	31	265	2950	0	0	0.44	2	5730	1682
1-18-62				16.02	17.60	56.00	0.89		0.51	5.52	83.19						
				18	19	62	1		1	6	93					5091	
11S/ 5W-23E 1 S	67	5.6	19920	387	593	3405	74	0	10	610	7228	0	0.7	0.66	1	14270	3407
3-12-64				19.31	48.77	148.05	1.89		0.16	12.70	203.83						
				9	22	68	1			6	94					12304	
11S/ 5W-23E 2 S	69	7.0	20500	500	590	4200	80	0	315	1033	7358	0	0	1.10	19	16256	3676
3-26-61				24.95	48.52	182.62	2.05		5.16	21.51	207.50						
				10	19	71	1		2	9	89					13936	
11S/ 5W-23E 3 S	64	7.8	17250	446	474	3400	55	0	318	879	6773	0	0.2	0.84	19	12446	3064
11-26-62				22.26	38.98	147.83	1.41		5.21	18.30	191.00						
				11	19	70	1		2	9	89					12203	
11S/ 5W-23E 4 S	69	6.7	22381	557	648	3875	70	0	298	1057	8050	3.7	0.9	1.08	21	15320	4057
9-26-61				27.79	53.29	168.49	1.79		4.88	22.01	227.01	0.06					
				11	21	67	1		2	9	89					14430	
11S/ 5W-24B 1 S	67	8.2	1227	12	12	230	5	0	122	92	279	0	0	0.50	3	792	80
10-21-57				0.60	0.99	10.00	0.13		2.00	1.92	7.87						
				5	8	85	1		17	16	67					693	
11S/ 5W-24B 2 S	68	7.7	2695	126	104	292	11	0	171	270	690	2.5	0.2	0.16	6	1740	743
3-13-64				6.29	8.55	12.70	0.28		2.80	5.62	19.46	0.04					
				23	31	46	1		10	20	70					1586	

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				

SAN LUIS REY HYDRO UNIT 20300

MONSERATE HYDRO SUBUNIT 20380

9S/ 2W-23K 1 S	72	7.7	695	62	19	56	4	0	263	58	63	0	0.2	0.05	34	426	233
8-21-63				3.09	1.56	2.43	0.10		4.31	1.21	1.78						
				43	22	34	1		59	17	24					426	
9S/ 2W-23Q 1 S	74	8.2	650	43	29	56	3	0	264	29	66	3.2	0.1	0.29	--	404	227
6-12-64				2.15	2.38	2.43	0.08		4.33	0.60	1.86	0.05					
				31	34	35	1		63	9	27	1				359	
9S/ 2W-26H 1 S	72	8.2	635	48	27	52	4	0	252	60	56	4	0.2	0.05	--	392	231
6-12-64				2.40	2.22	2.26	0.10		4.13	1.25	1.58	0.06					
				34	32	32	1		59	18	23	1				375	
9S/ 2W-26P 1 S	--	8.0	720	81	19	52	5	0	195	160	53	0	0.2	0.08	32	522	280
10-25-63				4.04	1.56	2.26	0.13		3.20	3.33	1.49						
				51	20	28	2		40	42	19					498	
9S/ 2W-27G 1 S	--	7.6	650	38	34	45	3	0	238	65	54	4.6	0.1	0.05	29	424	235
8-21-63				1.90	2.80	1.96	0.08		3.90	1.35	1.52	0.07					
				28	42	29	1		57	20	22	1				390	
9S/ 2W-28N 1 S	--	7.1	745	60	22	62	2	0	201	77	93	2	0.2	0.18	39	520	240
2-12-59				2.99	1.81	2.70	0.05		3.29	1.60	2.62	0.03					
				40	24	36	1		44	21	35					456	
9S/ 2W-28N 2 S	--	7.3	894	80	30	70	2	0	228	149	94	0	0.2	0.15	30		323
11-16-60				3.99	2.47	3.04	0.05		3.74	3.10	2.65					644	
				42	26	32	1		39	33	28					567	
9S/ 2W-31Q 1 S	70	7.7	1410	140	55	95	3	0	344	171	214	12	0.2	0.23	35	1056	576
10-25-63				6.99	4.52	4.13	0.08		5.64	3.56	6.03	0.19					
				44	29	26	1		37	23	39	1				895	
9S/ 2W-32A 1 S	70	8.2	760	68	24	58	5	0	232	110	60	0	0.3	0.13	26		268
11- 4-60				3.39	1.97	2.52	0.13		3.80	2.29	1.69					522	
				42	25	31	2		49	29	22					465	
9S/ 2W-32G 1 S	70	7.8	846	80	27	61	5	0	229	162	65	0	0.3	0.18	26		311
11- 4-60				3.99	2.22	2.65	0.13		3.75	3.37	1.83					572	
				44	25	29	1		42	38	20					539	
9S/ 2W-32L 1 S	71	7.3	1000	64	47	76	4	0	242	194	85	0	0.2	0.16	25	658	353
7-21-63				3.19	3.87	3.30	0.10		3.97	4.04	2.40						
				30	37	32	1		38	39	23					614	
9S/ 2W-36B 1 S	--	8.1	371	25	5	40	4	0	58	65	37	3.6	0.5	0.02	4	202	83
3- 8-61				1.25	0.41	1.74	0.10		0.95	1.35	1.04	0.06					
				36	12	50	3		28	40	31	2				213	
9S/ 2W-36H 1 S	69	7.1	640	65	18	46	4	0	162	150	41	5.1	0.2	0	28	412	236
8-22-63				3.24	1.48	2.00	0.10		2.66	3.12	1.16	0.08					
				48	22	29	1		38	44	17	1				437	
9S/ 2W-36H 2 S	--	7.0	630	63	18	41	4	0	156	131	37	5.6	0.4	0.02	32	407	231
3- 8-61				3.14	1.48	1.78	0.10		2.56	2.73	1.04	0.09					
				48	23	27	2		40	43	16	1				409	
10S/ 1W- 5L 1 S	--	7.2	780	89	27	40	4	0	246	224	39	13	0.3	0.03	33	562	333
3- 8-61				4.44	2.22	1.74	0.10		4.03	4.66	1.10	0.21					
				52	26	20	1		40	47	11	2				590	
10S/ 1W- 5N 1 S	70	7.3	790	80	31	43	5	0	156	242	38	6.8	0.2	0.08	29	564	327
8-22-63				3.99	2.55	1.87	0.13		2.56	5.04	1.07	0.11					
				47	30	22	2		29	57	12	1				552	
10S/ 1W- 9B 1 S	--	8.0	313	49	13	23	4	0	101	96	16	29	0	0.03	40	313	176
4-17-59				2.45	1.07	1.00	0.10		1.66	2.00	0.45	0.47					
				53	23	22	2		36	44	10	10				320	
10S/ 1W- 9M 1 S	70	7.7	494	47	10	35	4	0	150	86	19	2.4	0.2	0.11	26	276	159
11- 2-60				2.35	0.82	1.52	0.10		2.46	1.79	0.54	0.04					
				49	17	32	2		51	37	11	1				303	
10S/ 1W-10H 1 S	--	7.1	1007	134	40	56	9	0	172	423	42	2	0.2	0.26	30	794	499
2-11-59				6.69	3.29	2.43	0.23		2.82	8.81	1.18	0.03					
				53	26	19	2		22	69	9					821	
10S/ 1W-10H 2 S	--	8.0	1300	146	54	81	11	0	149	583	50	1.8	0.5	0.05	16	1073	587
2-11-59				7.29	4.44	3.52	0.28		2.44	12.14	1.41	0.03					
				47	29	23	2		15	76	9					1019	
10S/ 1W-16E 1 S	68	7.2	1100	115	44	71	4	0	198	347	62	5.8	0.1	0.13	29	808	468
8-22-63				5.74	3.62	3.09	0.10		3.25	7.22	1.75	0.09					
				46	29	25	1		26	59	14	1				775	
10S/ 1W-16H 1 S	--	7.8	445	45	13	40	3	0	183	55	39	3.6	0.2	0.05	30	302	166
11-21-63				2.25	1.07	1.74	0.08		3.00	1.15	1.10	0.06					
				44	21	34	2		56	22	21	1				319	
10S/ 1W-16H 2 S	76	7.2	581	40	18	47	3	0	189	43	57	11.1	0	0	--		174
9-27-56				2.00	1.48	2.04	0.08		3.10	0.90	1.61	0.18				344	
				36	26	36	1		54	16	28	3				312	

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million, equivalents per million, percent reactance value: Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Chemical constituents in parts per million: Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C Evap 105°C Computed	Total hardness as $CaCO_3$
SAN LUIS REY HYDRO UNIT 20300																	
MONSERATE HYDRO SUBUNIT 20380																	
10S/ 1W-16R 1 S	68	7.1	1300	157	53	69	5	0	188	528	47	7.7	0.2	0.11	31	1080	610
8-22-63				7.83	4.36	3.00	0.13		3.08	10.99	1.33	0.12					
				51	28	20	1		20	71	9	1				990	
10S/ 1W-17A 1 S	--	8.0	955	73	27	46	4	0	174	197	43	0	0.2	0.15	22		293
11- 3-60				3.64	2.22	2.00	0.10		2.85	4.10	1.21					500	
				46	28	25	1		35	50	15					498	
10S/ 1W-17B 1 S	--	7.1	544	37	25	43	3	0	185	74	40	1.9	0.4	0	23	368	196
11- 3-60				1.85	2.06	1.87	0.08		3.03	1.54	1.13	0.03					
				32	35	32	1		53	27	20	1				338	
10S/ 1W-17C 1 S	--	7.1	580	50	17	42	3	0	183	77	45	1.7	0.2	0.07	27		195
7-18-61				2.50	1.40	1.83	0.08		3.00	1.60	1.27	0.03				360	
				43	24	31	1		51	27	22	1				353	
10S/ 1W-20B 1 S	--	8.1	446	25	13	47	3	0	162	9	48	3.7	0	0.11	52	265	116
4-17-59				1.25	1.07	2.04	0.08		2.66	0.19	1.35	0.06					
				28	24	46	2		62	4	32	1				280	
10S/ 1W-22B 1 S	--	7.9	506	49	16	35	3	0	179	65	31	2.1	0.2	0.11	35		189
11- 3-60				2.45	1.32	1.52	0.08		2.93	1.35	0.87	0.03				342	
				46	25	28	1		57	26	17	1				324	
10S/ 1W-22D 1 S	--	7.8	625	53	16	41	4	0	179	86	37	4.4	0.2	0.03	31		198
11- 3-60				2.64	1.32	1.78	0.10		2.93	1.79	1.04	0.07				368	
				45	23	30	2		50	31	18	1				361	
10S/ 1W-22L 1 S	70	7.2	543	49	16	40	4	0	186	43	49	6.0	0.2	0.05	31		189
7-18-61				2.45	1.32	1.74	0.10		3.05	0.90	1.38	0.10				326	
				44	24	31	2		56	17	25	2				330	
10S/ 1W-22P 1 S	--	7.7	520	45	17	50	3	0	206	58	41	5.8	0.2	0.09	27	348	183
11-21-63				2.25	1.40	2.17	0.08		3.38	1.21	1.16	0.09					
				38	24	37	1		58	21	20	2				348	
10S/ 1W-23K 1 S	69	7.7	439	38	13	32	4	0	161	54	20	3.6	0.3	0	48	259	149
4-24-61				1.90	1.07	1.39	0.10		2.64	1.12	0.56	0.06					
				43	24	31	2		60	26	13	1				292	
10S/ 1W-23N 1 S	80	7.4	395	42	12	29	5	0	151	72	18	2.3	0.4	0.02	45		155
6-15-56				2.10	0.99	1.26	0.13		2.47	1.50	0.51	0.04				310	
				47	22	28	3		55	33	11	1				300	
10S/ 1W-23N 2 S	--	7.3	545	50	16	42	3	0	182	77	33	5.8	0.2	0.03	35	334	191
8-22-63				2.50	1.32	1.83	0.08		2.98	1.60	0.93	0.09					
				44	23	32	1		53	29	17	2				351	
10S/ 1W-35C 1 S	71	7.5	550	54	12	49	3	0	220	46	51	1.3	0.2	0.03	26	328	184
8-22-63				2.69	0.99	2.13	0.08		3.61	0.96	1.44	0.02					
				46	17	36	1		60	16	24					351	
10S/ 1W-36H 1 S	68	7.0	994	72	24	63	3	0	241	85	92	6.5	0.3	0.51	33		278
11- 7-60				3.59	1.97	2.74	0.08		3.95	1.77	2.59	0.10				550	
				43	24	33	1		47	21	31	1				498	
10S/ 1W-36J 1 S	65	7.0	946	84	32	73	4	0	252	120	117	21	0.3	0.11	29		341
11- 7-60				4.19	2.63	3.17	0.10		4.13	2.50	3.30	0.34				624	
				42	26	31	1		40	24	32	3				604	
10S/ 2W- 6F 2 S	68	7.9	1065	107	33	66	6	0	217	194	125	0	0.2	0.13	26		403
11- 2-60				5.34	2.71	2.87	0.15		3.56	4.04	3.53					772	
				48	24	26	1		32	36	32					664	
10S/ 2W- 6G 1 S	67	7.4	1040	91	33	86	5	0	273	211	84	0	0.2	0.11	26	694	363
8-22-63				4.54	2.71	3.74	0.13		4.47	4.39	2.37						
				41	24	34	1		40	39	21					671	
11S/ 1W-11D 1 S	--	7.3	640	61	13	53	3	0	228	34	74	2.1	0.1	0.13	29	398	206
8-22-63				3.04	1.07	2.30	0.08		3.74	0.71	2.09	0.03					
				47	16	35	1		57	11	32					381	
11S/ 1W-11E 1 S	--	7.3	860	86	26	62	3	0	267	72	117	4.3	0.2	0.05	30	552	322
8-22-63				4.29	2.14	2.70	0.08		4.38	1.50	3.30	0.07					
				47	23	29	1		47	16	36	1				532	
WARNER HYDRO SUBUNIT 20300																	
9S/ 2E-36N 1 S	--	7.5	905	85	24	80	3	0	387	64	71	8.1	0.3	0.05	52	523	311
8- 9-62				4.24	1.97	3.48	0.08		6.34	1.33	2.00	0.13					
				43	20	36	1		65	14	20	1				578	
9S/ 2E-36Q 1 S	--	7.0	722	62	19	60	4	0	143	156	59	12	0.3	0.02	50	469	233
8- 9-62				3.09	1.56	2.61	0.10		2.34	3.25	1.66	0.19					
				42	21	35	1		31	44	22	3				493	
10S/ 2E- 1A 1 S	--	7.4	660	58	19	52	2	0	218	48	71	8.1	0.3	0.07	--		223
5- 3-56				2.89	1.56	2.26	0.05		3.57	1.00	2.00	0.13				437	
				43	23	33	1		53	15	30	2				366	

SAN LUIS REY HYDRO UNIT 20300

WARNER HYDRO SUBUNIT 203C0

State well number Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C Evap 105°C Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
10S/ 2E- 1A 2 S 8- 9-62	--	6.9	525	35 1.75 34	15 1.23 24	47 2.04 39	6 0.15 3	0	104 1.70 32	120 2.50 47	35 0.99 19	5.0 0.08 2	0.4	0.02	56	347 371	149
10S/ 2E-26A 1 S 6-26-57	--	8.2	455	37 1.85 41	10 0.82 18	41 1.78 40	2 0.05 1	0	150 2.46 55	62 1.29 29	26 0.73 16	0.3	0.4	0.11	21	323 274	134
10S/ 3E- 8R 1 S 1- 4-60	--	8.1	--	44 2.20 43	11 0.90 17	46 2.00 39	2 0.05 1	--	125 2.05 44	80 1.67 36	33 0.93 20	0.1	0.4	--	--	340 278	155
10S/ 3F-25QS1 S 11-20-63	129	9.4	420	5 0.25 5	1 0.08 2	99 4.30 92	2 0.05 1	39 1.30 30	43 0.70 16	45 0.94 22	47 1.33 31	0	8.0	0.71	62	372 330	17
10S/ 3E-26L 1 S 11-20-63	--	7.9	400	32 1.60 33	10 0.82 17	54 2.35 48	3 0.08 2	0	216 3.54 76	7 0.15 3	27 0.76 16	11 0.18 4	0.2	0.11	20	268 271	121
10S/ 3E-26L 2 S 8-16-60	--	7.4	556	--	--	--	--	0	250 4.10	--	37 1.04	--	--	--	--		178
10S/ 3E-26L 3 S 4-27-62	--	7.7	465	38 1.90 38	9 0.74 15	52 2.26 45	4 0.10 2	0	217 3.56 73	5 0.10 2	34 0.96 20	17 0.27 6	0.4	0.05	23	261 289	132
10S/ 3E-29J 1 S 8- 5-55	65	8.1	855	42 2.10 31	9 0.74 11	92 4.00 58	1 0.03	0	244 4.00 57	55 1.15 16	64 1.80 26	2.4 0.04 1	0.6	0.09	--	399 386	142
10S/ 3E-29L 1 S 8- 5-55	66	7.7	709	45 2.25 37	12 0.99 16	66 2.87 47	2 0.05 1	0	241 3.95 62	45 0.94 15	50 1.41 22	3.5 0.06 1	0.5	0.20	--	357 343	162
10S/ 3E-30A 1 S 8- 5-55	69	7.9	1138	56 2.79 26	14 1.15 11	152 6.61 62	2 0.05	0	189 3.10 29	189 3.93 37	128 3.61 34	2.8 0.05	1.1	0.12	--	672 636	197
10S/ 3E-33F 1 S 8- 5-55	68	8.4	658	35 1.75 33	6 0.49 9	70 3.04 57	2 0.05 1	2 0.07 1	163 2.67 50	55 1.15 21	51 1.44 27	3.5 0.06 1	0.2	0	--	308 305	112
10S/ 3E-33H 1 S 9- 2-54	--	8.3	449	34 1.70 38	7 0.58 13	50 2.17 48	2 0.05 1	--	153 2.51 60	24 0.50 12	39 1.10 26	6.4 0.10 2	0.6	0.05	--	271 238	114
10S/ 3E-33L 1 S 9- 2-54	--	8.0	505	42 2.10 42	8 0.66 13	50 2.17 44	2 0.05 1	--	186 3.05 60	36 0.75 15	43 1.21 24	4.6 0.07 1	0.6	0.12	--	302 278	138
10S/ 3E-33P 1 S 9-13-56	68	7.5	450	41 2.05	10 0.82	--	--	--	200 3.28	--	43 1.21	--	--	--	--	320	144
10S/ 3E-34M 1 S 4-27-62	69	7.7	482	32 1.60 33	4 0.33 7	65 2.83 59	2 0.05 1	0	140 2.29 47	51 1.06 22	48 1.35 28	6.7 0.14 3	0.2	0.07	25	285 305	97
11S/ 2E-24F 1 S 6-11-61	68	6.8	402	38 1.90 49	10 0.62 21	23 1.00 26	6 0.15 4	0	104 1.70 43	76 1.58 40	21 0.59 15	3.7 0.06 2	0.3	0.03	48	267 277	136
11S/ 2E-24GS1 S 8-20-53	--	7.5	319	33 1.65 49	7 0.58 17	23 1.00 30	6 .15 4	0	132 2.16 65	26 0.58 17	20 0.56 17	1.2 0.02 1	0.1	0.10	--	216 183	112
11S/ 2E-26AS1 S 11- 3-52	[illegible]	7.1	175	11 0.55	3 0.25	21 0.91	3 0.08	--	61 1.00	--	17 0.48	0.4 0.01	--	0.37	--		40
11S/ 3E- 3N 1 S 11-20-63	--	7.6	265	22 1.10 40	4 0.33 12	30 1.30 47	1 0.03 1	0	121 1.98 74	12 0.25 9	14 0.39 15	3.6 0.06 2	0.4	0.06	22	156 165	72
11S/ 3E- 7G 1 S 1- 4-61	--	--	--	16 0.80 18	10 0.82 19	62 2.70 62	1 0.03 1	0	110 1.80 56	22 0.46 14	34 0.96 30	0.1	0.9	--	--	200	81
11S/ 3E-18P 1 S 11-20-63	--	7.4	280	24 1.20 38	7 0.58 18	30 1.30 41	3 0.08 3	0	120 1.97 65	6 0.12 4	22 0.62 20	20 0.32 11	0.1	0.06	38	210 209	89
11S/ 4E-15Q 1 S 6-16-64	70	8.2	670	51 2.54 35	14 1.15 16	79 3.43 48	2 0.05 1	0	221 3.62 51	83 1.73 24	63 1.78 25	0	0.6	0.07	--	416 401	185
11S/ 5E-18P 1 S 6-16-64	66	8.1	645	50 2.50 36	12 0.99 14	80 3.48 50	2 0.05 1	0	264 4.33 62	20 0.42 6	72 2.03 29	15 0.24 3	0.2	0.07	--	390 381	175

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
CARLSBAD HYDRO UNIT 20400																	
LOMA ALTA HYDRO SUBUNIT 204A0																	
11S/ 4W-19H 1 S	68	7.7	2200	139	38	234	1	0	344	46	510	4.4	0.3	0.28	37		504
10-19-55				6.94	3.13	10.17	0.03		5.64	0.96	14.38	0.07					
				34	15	50			27	5	68					1179	
11S/ 4W-19H 2 S	--	8.5	1895	65	29	244	8	9	127	51	470	0.8	0.1	0.10	26	995	281
12-20-57				3.24	2.38	10.61	0.20	0.30	2.08	1.06	13.25	0.01					
				20	14	65	1	2	12	6	79					965	
11S/ 4W-21M 1 S	--	8.0	3436	232	66	420	1	0	376	103	950	7.4	0.7	0.44	42	2710	851
6-18-64				11.58	5.43	18.26	0.03		6.16	2.14	26.79	0.12					
				33	15	52			17	6	76					2007	
VISTA HYDRO SUBUNIT 204B0																	
11S/ 3W-17L 1 S	68	7.0	2183	139	135	135	3	0	339	247	416	89	0.4	0.12	70	1690	903
6-18-64				6.94	11.10	5.87	0.08		5.56	5.14	11.73	1.44					
				29	46	24			23	22	49	6				1401	
11S/ 3W-17P 1 S	68	7.4	1891	115	91	120	4	0	321	183	325	39	0.2	0.41	50	1261	662
6-12-59				5.74	7.48	5.22	0.10		5.26	3.81	9.17	0.63					
				31	40	28	1		28	20	49	3				1085	
11S/ 3W-19G 1 S	--	7.8	2232	159	127	150	2	0	324	137	570	56	0.2	0.10	--		919
5-13-52				7.93	10.44	6.52	0.05		5.31	2.85	16.07	0.90					
				32	42	26			21	11	64	4				1361	
11S/ 3W-19M 1 S	69	7.4	2180	153	110	177	1	0	436	249	423	20	0.1	0.26	43	1546	835
10-29-63				7.63	9.05	7.70	0.03		7.15	5.18	11.93	0.32					
				31	37	32			29	21	49	1				1391	
11S/ 3W-29G 1 S	--	8.3	1434	43	49	177	6	10	136	101	336	0	0	0.31	0	931	309
6-12-59				2.15	4.03	7.70	0.15	0.33	2.23	2.10	9.48						
				15	29	55	1	2	16	15	67					789	
11S/ 4W-24R 1 S	65	8.1	1934	133	116	150	2	0	351	123	485	21	0.2	0.10	--		810
5-13-52				6.64	9.54	6.52	0.05		5.75	2.56	13.68	0.34					
				29	42	29			26	11	61	2				1203	
11S/ 4W-25C 1 S	69	7.5	1550	80	56	129	4	0	283	79	294	4	0.3	0.07	35	989	430
6-12-59				3.99	4.61	5.61	0.10		4.64	1.64	8.29	0.06					
				28	32	39	1		32	11	57					820	
11S/ 4W-25E 1 S	--	7.5	1550	81	74	143	5	0	270	178	272	27	0.2	0.17	32	1042	507
10-29-63				4.04	6.09	6.22	0.13		4.43	3.71	7.67	0.44					
				25	37	38	1		27	23	47	3				945	
11S/ 4W-32C 1 S	--	7.2	2405	129	42	321	10	0	236	78	656	2.2	0.5	0.84	3		495
9- 7-60				6.44	3.45	13.96	0.26		3.87	1.62	18.50	0.04				1660	
				27	14	58	1		16	7	77					1359	
11S/ 4W-33F 1 S	--	7.9	2080	109	52	280	2	0	256	106	541	0	0.2	0.67	18	1336	486
10-29-63				5.44	4.28	12.17	0.05		4.20	2.21	15.26						
				25	20	55			19	10	70					1235	
11S/ 4W-33GS1 S	--	8.1	1513	65	43	185	3	0	207	69	357	2.5	0.6	0.34	43	950	339
6-18-64				3.24	3.54	8.04	0.08		3.39	1.44	10.07	0.04					
				22	24	54	1		23	10	67					870	
12S/ 5W- 1J 1 S	70	8.7	1450	49	21	281	30	10	32	393	266	2.3	0.3	0.10	14	1088	209
9-14-56				2.45	1.73	12.22	0.77	0.33	0.52	8.18	7.50	0.04					
				14	10	71	4	2	3	49	45					1082	
AGUA HEDIONDA HYDRO SUBUNIT 204C0																	
12S/ 4W- 3R 1 S	--	8.4	1630	55	38	240	20	0	17	125	487	0	0.2	0.43	--	1080	294
6-20-64				2.74	3.13	10.44	0.51		0.28	2.60	13.73						
				16	19	62	3		2	16	83					974	
12S/ 4W- 9G 1 S	--	7.6	3058	142	82	390	3	0	395	249	680	2.5	0.7	0.58	35	1910	692
6-17-64				7.09	6.74	16.96	0.08		6.47	5.18	19.18	0.04					
				23	22	55			21	17	62					1779	
12S/ 4W-10D 1 S	68	7.9	2950	196	68	390	6	0	432	248	684	42	0.2	0.60	--	1726	769
6-17-64				9.78	5.59	16.96	0.15		7.08	5.16	19.29	0.68					
				30	17	52			22	16	60	2				1847	
12S/ 4W-10E 1 S	--	8.3	1808	107	49	200	4	7	288	66	420	4.9	0.8	0.28	21	1160	469
6-10-64				5.34	4.03	8.70	0.10	0.23	4.72	1.37	11.84	0.08					
				29	22	46	1	1	26	8	65					1022	
12S/ 4W-10G 1 S	72	8.0	1990	108	68	199	3	0	317	117	429	13	0.5	0.16	27	1137	549
7-28-61				5.39	5.59	8.65	0.08		5.20	2.44	12.10	0.21					
				27	28	44			26	12	61	1				1120	
12S/ 4W-10G 2 S	70	7.3	1968	121	57	210	6	0	325	133	426	1.5	0.6	0.56	41		537
9- 7-60				6.04	4.69	9.13	0.15		5.33	2.77	12.07	0.02				1240	
				30	23	46	1		26	14	60					1158	

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
CARLSBAD HYDRO UNIT 20400																	
AGUA HEDIONDA HYDRO SUBUNIT 204C																	
12S/ 4W-10G 3 S	--	7.4	--	128	55	204	2	0	249	101	460	0	0.7	--	--	1215	546
10- 8-59				6.39	4.52	8.87	0.05		4.08	2.10	12.97						
				32	23	45			21	11	68					1073	
12S/ 4W-10H 2 S	--	7.9	1100	87	28	115	5	0	145	312	99	1.0	0.1	0.13	10	746	332
7-25-62				4.34	2.30	5.00	0.13		2.38	6.50	2.79	0.02					
				37	20	42	1		20	56	24					726	
12S/ 4W-10H 3 S	--	7.3	2430	177	83	290	3	0	394	131	604	0	0.4	0.30	23	1760	764
10-29-63				8.83	6.83	12.61	0.08		6.46	2.73	17.02						
				31	24	44			23	10	67					1565	
12S/ 4W-10J 1 S	--	7.9	1625	92	55	225	2	0	260	113	433	0	0.2	0.45	22	1122	456
10-29-63				4.59	4.52	9.78	0.05		4.26	2.35	12.21						
				24	24	52			23	12	65					1070	
12S/ 4W-11E 1 S	70	6.3	1650	64	56	220	5	5	326	49	379	0	0.6	0.30	--	992	390
6-16-64				3.19	4.61	9.57	0.13	0.17	5.34	1.02	10.69						
				18	26	55	1	1	31	6	62					939	
12S/ 4W-11P 1 S	69	7.6	1730	78	62	200	3	0	276	62	424	0	0.4	0.31	--	1072	450
6-10-64				3.89	5.10	8.70	0.08		4.52	1.29	11.96						
				22	29	49			25	7	67					965	
12S/ 4W-15M 1 S	65	7.0	2754	176	99	294	13	0	54	802	424	5	2.1	1.50	--	1990	847
6-15-64				8.78	8.14	12.78	0.33		0.89	16.70	11.96	0.08					
				29	27	43	1		3	56	40					1843	
12S/ 4W-16J 1 S	72	7.2	1770	100	46	185	2	0	138	224	351	20	0.2	0.04	24		437
4-11-62				4.99	3.78	8.04	0.05		2.26	4.66	9.90	0.32				1098	
				30	22	48			13	27	58	2				1021	
ENCINAS HYDRO SUBUNIT 20400																	
12S/ 4W-21B 1 S	--	8.2	2266	176	41	258	7	0	224	248	513	5	0.5	0.44	4		608
9- 7-60				8.78	3.37	11.22	0.18		3.67	5.16	14.47	0.08				1600	
				37	14	48	1		16	22	62					1363	
12S/ 4W-21B 2 S	--	7.8	1981	182	29	178	5	0	246	281	357	0	0.6	0.26	20	1330	573
8- 4-58				9.08	2.38	7.74	0.13		4.03	5.85	10.07						
				47	12	40	1		20	29	50					1174	
12S/ 4W-21E 1 S	59	7.8	3160	183	63	460	2	0	344	177	850	36.7	1.2	0.60	--		716
11-30-54				9.13	5.18	20.00	0.05		5.64	3.69	23.97	0.59				2190	
				27	15	58			17	11	71	2				1943	
SAN MARCOS HYDRO SUBUNIT 204E0																	
11S/ 3W-25N 2 S	68	7.0	1320	82	69	85	3	0	259	64	271	40	0.3	0.09	63	980	488
6-18-64				4.09	5.67	3.70	0.08		4.25	1.33	7.64	0.65					
				30	42	27	1		31	10	55	5				805	
12S/ 3W-12M 1 S	--	7.8	1720	82	57	101	3	0	259	42	262	26.6	0.4	0	--		439
8- 3-55				4.09	4.69	4.39	0.08		4.25	0.87	7.39	0.43				848	
				31	35	33	1		33	7	57	3				701	
12S/ 3W-16L 1 S	--	7.2	8540	508	217	970	3	0	177	486	2548	19.2	0.3	0.10	--		2162
8-18-53				25.35	17.85	42.18	0.08		2.90	10.12	71.85	0.31				6412	
				30	21	49			3	12	84					4839	
12S/ 4W-26H 1 S	76	8.2	1400	46	30	215	2	0	221	92	297	0	0.6	0.33	26	788	239
10-30-63				2.30	2.47	9.35	0.05		3.62	1.92	8.38						
				16	17	66			26	14	60					818	
12S/ 4W-26N 1 S	--	7.2	2050	72	3	387	1	0	46	447	365	0	0.9	1.30	10		192
10-23-61				3.59	0.25	16.83	0.03		0.75	9.31	10.29					1436	
				17	1	81			4	46	51					1310	
12S/ 4W-26N 2 S	--	7.1	2100	31	6	444	4	0	49	458	385	0	0.8	1.50	10		102
10-23-61				1.55	0.49	19.31	0.10		0.80	9.54	10.86					1330	
				7	2	90			4	45	51					1364	
12S/ 4W-28Q 1 S	70	7.9	1900	10	1	430	2	0	102	24	606	0	0.2	0.89	--	1228	29
6-18-64				0.50	0.08	18.70	0.05		1.67	0.50	17.09						
				3		97			9	3	89					1124	
12S/ 4W-33P 1 S	70	7.3	2470	164	93	192	8	--	174	290	503	77	0.1	0.27	--		792
8-25-54				8.18	7.65	8.35	0.20		2.85	6.04	14.18	1.24				1810	
				34	31	34	1		12	25	58	5				1413	
12S/ 4W-34K 1 S	--	7.5	2240	122	50	294	3	0	378	176	466	14	0.8	0.48	30		510
4-26-61				6.09	4.11	12.78	0.08		6.20	3.66	13.14	0.23				1390	
				26	18	55			27	16	57	1				1342	
12S/ 4W-35L 1 S	70	7.8	2240	116	54	280	2	--	400	193	390	51	0.1	0.45	--	1358	512
8-25-54				5.79	4.44	12.17	0.05		6.56	4.02	11.00	0.82					
				26	20	54			29	18	49	4				1283	

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
CARLSBAD HYDRO UNIT 20400																	
SAN MARCOS HYDRO SUBUNIT Z04E0																	
12S/ 4W-36C 1 S	72	8.0	1900	54	66	281	1	0	354	190	369	27	0.5	0.26	12	1053	406
7-27-61				2.69	5.43	12.22	0.03		5.80	3.96	10.41	0.44					
				13	27	60			28	19	51	2				1175	
12S/ 4W-36E 1 S	74	7.8	3700	194	108	451	11	0	360	399	869	14	0.7	0.22	25	2362	929
7-27-61				9.68	8.88	19.61	0.28		5.90	8.31	24.51	0.23					
				25	23	51	1		15	21	63	1				2249	
13S/ 4W- 2P 1 S	--	6.5	1200	76	44	120	--	0	78	232	180	--	--	0.50	50	812	371
9-19-62				3.79	3.62	5.22			1.28	4.83	5.08						
13S/ 4W- 2Q 1 S	--	6.9	1513	85	58	151	3	0	83	341	235	26	0.4	0.20	37	1090	451
6-18-64				4.24	4.77	6.57	0.08		1.36	7.10	6.63	0.42					
				27	30	42	1		9	46	43	3				977	
13S/ 4W-10K 1 S	--	6.8	1395	46	20	196	10	0	68	180	236	--	--	0.60	51	860	197
9-25-62				2.30	1.64	8.52	0.26		1.11	3.75	6.66						
13S/ 4W-11K 1 S	--	7.4	1090	53	24	125	11	--	105	190	153	17	0.4	--	40	665	231
6-25-58				2.64	1.97	5.44	0.28		1.72	3.96	4.31	0.27					
				26	19	53	3		17	39	42	3				665	
ESCONDIDO HYDRO SUBUNIT Z04F0																	
11S/ 1W-27F 1 S	65	7.8	570	38	18	59	1	0	188	38	72	6	0.2	0.05	--	358	169
6-17-64				1.90	1.48	2.57	0.03		3.08	0.79	2.03	0.10					
				32	25	43	1		51	13	34	2				325	
11S/ 1W-31P 2 S	--	6.8	1166	80	32	102	2	0	224	99	181	17	0.7	0	62	747	331
1- 8-63				3.99	2.63	4.43	0.05		3.67	2.06	5.10	0.27					
				36	24	40			33	19	46	2				686	
11S/ 1W-34G 1 S	64	8.0	440	25	10	57	1	0	129	25	51	23	0.4	0.05	--	282	104
6-17-64				1.25	0.82	2.48	0.03		2.11	0.52	1.44	0.37					
				27	18	54	1		48	12	32	8				256	
11S/ 2W-21K 1 S	--	6.9	1333	65	44	136	1	0	232	55	266	11	0.5	0.07	58	878	343
1-10-63				3.24	3.62	5.91	0.03		3.80	1.15	7.50	0.18					
				25	28	46			30	9	59	1				751	
11S/ 2W-33Q 1 S	--	7.3	1560	101	44	148	4	0	344	52	296	5.0	0.2	0.17	35	1048	433
1-10-63				5.04	3.62	6.44	0.10		5.64	1.08	8.35	0.08					
				33	24	42	1		37	7	55	1				854	
11S/ 2W-34F 1 S	--	7.0	--	61	24	120	--	0	268	63	180	--	--	0.30	50	692	251
1-24-63				3.04	1.97	5.22			4.39	1.31	5.08						
12S/ 2W- 2K 1 S	--	7.6	2200	159	109	218	5	0	275	499	373	66	0.4	0.21	44	1808	845
11- 8-63				7.93	8.96	9.48	0.13		4.51	10.39	10.52	1.06					
				30	34	36			17	39	40	4				1609	
12S/ 2W- 2L 1 S	--	6.9	1653	120	50	145	6	0	278	203	254	47	0.4	0.34	30	1130	505
7-16-59				5.99	4.11	6.30	0.15		4.56	4.23	7.16	0.76					
				36	25	38	1		27	25	43	5				992	
12S/ 2W- 4P 3 S	--	7.2	1470	96	41	137	5	0	220	110	259	53	0.2	0.18	34	964	408
11- 8-63				4.79	3.37	5.96	0.13		3.61	2.29	7.30	0.85					
				34	24	42	1		26	16	52	6				843	
12S/ 2W- 9C 2 S	--	8.1	1226	82	33	127	7	0	148	336	113	0	0.2	0	6	851	340
7-16-57				4.09	2.71	5.52	0.18		2.43	7.00	3.19						
				33	22	44	1		19	55	25					777	
12S/ 2W- 9C 3 S	--	7.2	940	76	22	100	4	0	182	173	117	7.8	0.2	0.18	16	680	280
11- 8-63				3.79	1.81	4.35	0.10		2.98	3.60	3.30	0.13					
				38	18	43	1		30	36	33	1				606	
12S/ 2W- 9L 1 S	--	--	1290	--	--	--	--	--	--	--	192	--	--	0.08	--		
5- 3-51											5.41						
12S/ 2W- 9P 1 S	--	7.8	1655	78	73	227	2	0	354	160	351	24	0.9	0.05	37	1154	495
7- 2-63				3.89	6.00	9.87	0.05		5.80	3.33	9.90	0.39					
				20	30	50			30	17	51	2				1127	
12S/ 2W-10P 1 S	--	7.4	1083	41	41	116	2	0	276	96	114	39	0.7	0.10	60	688	271
1- 9-63				2.05	3.37	5.04	0.05		4.52	2.00	3.21	0.63					
				20	32	48			44	19	31	6				646	
12S/ 2W-11E 1 S	--	7.4	1074	43	21	157	2	0	270	116	90	75	0.7	0	53	672	194
1- 9-63				2.15	1.73	6.83	0.05		4.43	2.42	2.54	1.21					
				20	16	63			42	23	24	11				690	
12S/ 2W-11F 1 S	--	--	874	--	--	--	--	--	--	--	86	--	--	0.03	--		
5- 3-51											2.43						

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
ESCONDIDO HYDRO SUBUNIT 204F0				CARLSBAD HYDRO UNIT 20400													
12S/ 2W-11Q 1 S	--	--	1404	--	--	--	--	--	--	--	241	--	--	0	--		
5- 3-51											6.80						
12S/ 2W-12E 1 S	--	7.6	1970	106	97	220	5	0	227	272	288	320	0.2	0.23	47	1596	664
11- 8-63				5.29	7.98	9.57	0.13		3.72	5.66	8.12	5.16					
				23	35	42	1		16	25	36	23				1467	
12S/ 2W-12E 2 S	--	7.6	1300	54	45	165	1	0	284	87	224	38	0.1	0.19	31	858	320
11- 8-63				2.69	3.70	7.17	0.03		4.65	1.81	6.32	0.61					
				20	27	53			35	14	47	5				785	
12S/ 2W-13E 1 S	69	7.9	667	38	25	63	2	0	156	40	90	35	0.5	0.03	49	421	198
7- 3-63				1.90	2.06	2.74	0.05		2.56	0.83	2.54	0.56					
				28	31	41	1		39	13	39	9				419	
12S/ 2W-13G 1 S	--	7.3	1890	124	98	116	9	0	317	187	269	160	0.4	0.06	57	1161	713
1- 9-63				6.19	8.06	5.04	0.23		5.20	3.89	7.59	2.58					
				32	41	26	1		27	20	39	13				1176	
12S/ 2W-14A 1 S	--	--	1838	--	--	--	--	--	--	--	322	--	--	0.05	--		
5- 3-51											9.08						
12S/ 2W-14D 1 S	--	--	1894	--	--	--	--	--	--	--	348	--	--	0.05	--		
5- 3-51											9.81						
12S/ 2W-14E 1 S	--	7.4	--	76	40	170	2	0	294	99	197	9.3	0.3	--	--		354
8-11-60				3.79	3.29	7.39	0.05		4.82	2.06	5.56	0.15					
				26	23	51			38	16	44	1				738	
12S/ 2W-14F 1 S	--	7.5	940	46	33	104	4	0	182	63	177	19	0.2	0.13	45	658	251
11- 8-63				2.30	2.71	4.52	0.10		2.98	1.31	4.99	0.31					
				24	28	47	1		31	14	52	3				581	
12S/ 2W-14F 3 S	--	7.1	1266	65	31	143	1	0	270	59	212	28	0.5	0.05	52	749	290
1- 8-63				3.24	2.55	6.22	0.03		4.43	1.23	5.98	0.45					
				27	21	52			37	10	49	4				724	
12S/ 2W-15E 1 S	--	7.1	1060	55	29	123	2	0	219	42	198	26	0.4	0.05	47	682	256
10-19-62				2.74	2.38	5.35	0.05		3.59	0.87	5.58	0.42					
				26	23	51			34	8	53	4				630	
12S/ 2W-15F 1 S	--	--	787	--	--	--	--	--	--	--	137	--	--	0	--		
5- 3-51											3.86						
12S/ 2W-15J 1 S	--	7.6	1220	65	35	137	2	0	292	72	180	41	0.5	0.11	44	708	306
6- 6-63				3.24	2.88	5.96	0.05		4.79	1.50	5.08	0.66					
				27	24	49			40	12	42	5				720	
12S/ 2W-16B 1 S	--	7.9	1365	62	53	185	3	0	348	102	254	31	0.6	0.07	43	909	373
7- 2-63				3.09	4.36	8.04	0.08		5.70	2.12	7.16	0.50					
				20	28	52	1		37	14	46	3				905	
12S/ 2W-16N 1 S	--	7.7	1618	63	45	220	6	0	273	202	226	60	0.5	0.08	65	1010	342
6- 6-63				3.14	3.70	9.57	0.15		4.47	4.21	6.37	1.29					
				19	22	58	1		27	26	39	8				1042	
12S/ 2W-17H 1 S	81	7.4	1670	87	75	165	6	0	224	317	181	173	0.2	0.08	--	1166	526
6-24-64				4.34	6.17	7.17	0.15		3.67	6.60	5.10	2.79					
				24	35	40	1		20	36	28	15				1114	
12S/ 2W-17M 1 S	--	7.2	1308	65	37	130	3	0	104	103	243	78	0.6	0.04	50	837	314
1- 9-63				3.24	3.04	5.65	0.08		1.70	2.14	6.85	1.26					
				27	25	47	1		14	18	57	11				761	
12S/ 2W-17M 2 S	--	7.5	1188	51	39	129	4	0	159	70	208	70	0.7	0.72	48	713	288
6- 6-63				2.54	3.21	5.61	0.10		2.61	1.46	5.87	1.13					
				22	28	49	1		24	13	53	10				699	
12S/ 2W-18F 1 S	--	7.2	897	33	18	115	2	0	174	37	213	35	0.7	0.12	35	754	157
10-12-60				1.65	1.48	5.00	0.05		2.85	0.77	6.01	0.56					
				20	18	61	1		28	8	59	5				574	
12S/ 2W-20G 1 S	--	7.0	9000	650	435	660	15	0	556	249	2920	60	0.5	17.00	47	6600	3413
6- 6-63				32.44	35.77	28.70	0.38		9.11	5.18	82.34	0.97					
				33	37	29			9	5	84	1				5327	
12S/ 2W-20G 2 S	--	7.1	8000	677	456	670	14	0	556	303	3018	9.3	0.1	0.20	15	6934	3567
11- 8-63				33.78	37.50	29.13	0.36		9.11	6.31	85.11	0.15					
				34	37	29			9	6	85					5436	
12S/ 2W-20H 1 S	--	7.8	2420	88	67	325	3	0	410	134	513	26	0.8	0.17	30	1366	495
11-16-60				4.39	5.51	14.13	0.08		6.72	2.79	14.47	0.42					
				18	23	59			28	11	59	2				1388	
12S/ 2W-20H 2 S	--	--	2488	--	--	--	--	--	--	--	521	--	--	0.09	--		
5- 2-51											14.69						

CARLSBAD HYDRO UNIT 20400

ESCONDIDO HYDRO SUBUNIT 204F0

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million, equivalents per million, percent reactance value									Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C Evap 105°C Computed	Total hardness as $CaCO_3$
12S/ 2W-20H 3 S	--	--	2294	--	--	--	--	--	--	--	485	--	--	0.09	--		
5- 2-51											13.68						
12S/ 2W-20H 4 S	--	7.5	6600	203	295	475	10	0	381	114	1968	53	0.1	0.20	36	4518	1721
11-16-60				10.13	24.26	20.65	0.26		6.24	2.37	55.50	0.85					
				18	44	37			10	4	85	1				3342	
12S/ 2W-20H 5 S	64	7.6	3368	95	103	511	1	0	666	162	698	98	1.1	0.19	31	2095	661
11-16-60				4.74	8.47	22.22	0.03		10.92	3.37	19.68	1.58					
				13	24	63			31	9	55	4				2028	
12S/ 2W-20J 1 S	--	--	2222	--	--	--	--	--	--	--	457	--	--	0.10	--		
5- 2-51											12.89						
12S/ 2W-20J 2 S	--	--	2315	--	--	--	--	--	--	--	490	--	--	0.14	--		
5- 2-51											13.82						
12S/ 2W-20J 3 S	--	--	3289	--	--	--	--	--	--	--	770	--	--	0.12	--		
5- 2-51											21.71						
12S/ 2W-20J 4 S	--	--	2849	--	--	--	--	--	--	--	625	--	--	0.10	--		
5- 2-51											17.63						
12S/ 2W-20J 5 S	--	7.1	4665	200	174	531	7	0	329	185	1290	110	0.5	0.21	45	3190	1215
6- 6-63				9.98	14.31	23.09	0.18		5.39	3.85	36.38	1.77					
				21	30	49			11	8	77	4				2704	
12S/ 2W-20J 6 S	--	--	4348	--	--	--	--	--	--	--	1210	--	--	0.10	--		
5- 2-51											34.12						
12S/ 2W-20J 7 S	--	--	2604	--	--	--	--	--	--	--	540	--	--	0.18	--		
5- 3-51											15.23						
12S/ 2W-20J 9 S	--	7.4	2994	118	92	388	4	0	405	133	720	35	0.7	0.21	41	1855	674
6- 6-63				5.89	7.57	16.87	0.10		6.64	2.77	20.30	0.56					
				19	25	55			22	9	67	2				1731	
12S/ 2W-20J10 S	--	7.5	3395	102	85	525	5	0	706	216	908	15	0.6	0.30	21	2064	604
10-12-60				5.09	6.99	22.83	0.13		11.57	4.50	25.61	0.24					
				15	20	65			28	11	61	1				2225	
12S/ 2W-20K 1 S	--	7.2	7400	593	404	605	12	0	580	231	2681	5.1	0.1	5.00	33	4980	3143
11- 8-63				29.59	33.22	26.31	0.31		9.51	4.81	75.60	0.08					
				33	37	29			11	5	84					4854	
12S/ 2W-20K 2 S	--	7.3	1035	64	35	75	4	0	85	65	172	96	0.5	0.02	52	758	304
4-25-62				3.19	2.88	3.26	0.10		1.39	1.35	4.85	1.55					
				34	31	35	1		15	15	53	17				605	
12S/ 2W-20K 3 S	--	6.5	13568	970	795	940	16	0	361	139	5120	80	0.6	1.80	44	9720	5694
6- 6-63				48.40	65.38	40.87	0.41		5.92	2.89	144.38	1.29					
				31	42	26			4	2	93	1				8284	
12S/ 2W-20K 4 S	--	6.8	1330	93	56	97	4	0	79	102	286	116	0.2	0.27	40	1042	463
11- 8-63				4.64	4.61	4.22	0.10		1.29	2.12	8.07	1.87					
				34	34	31	1		10	16	60	14				833	
12S/ 2W-20Q 1 S	--	7.7	2250	79	51	341	4	0	433	303	355	0	1.2	0.65	37	1398	407
11-15-60				3.94	4.19	14.83	0.10		7.10	6.31	10.01						
				17	18	64			30	27	43					1385	
12S/ 2W-20Q 2 S	--	7.1	3061	146	79	420	17	0	417	432	535	24	0.7	0.97	50	1937	690
6- 6-63				7.29	6.50	18.26	0.43		6.83	8.99	15.09	0.39					
				22	20	56	1		22	29	48	1				1910	
12S/ 2W-20R 1 S	--	7.3	1965	130	89	120	4	0	199	216	308	189	0.3	0.08	35	1212	691
11-15-60				6.49	7.32	5.22	0.10		3.26	4.50	8.69	3.05					
				34	38	27	1		17	23	45	16				1189	
12S/ 2W-21D 1 S	--	--	1637	--	--	--	--	--	--	--	328	--	--	0.07	--		
5- 3-51											9.25						
12S/ 2W-21D 2 S	--	7.8	2000	70	57	330	2	0	443	238	334	24	0.6	0.40	31	1138	409
11- 8-63				3.49	4.69	14.35	0.05		7.26	4.96	9.42	0.39					
				15	21	64			33	23	43	2				1305	
12S/ 2W-21E 1 S	78	7.7	2200	156	99	200	10	0	381	151	522	3	0.2	0.20	28		797
9-12-56				7.78	8.14	8.70	0.26		6.24	3.14	14.72	0.05				1560	
				31	33	35	1		26	13	61					1357	
12S/ 2W-21M 1 S	--	7.6	2125	94	58	287	5	0	531	134	362	34	1.0	0.49	46	1290	473
8-17-60				4.69	4.77	12.48	0.13		8.70	2.79	10.21	0.55					
				21	22	57	1		39	13	46	2				1282	

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
ESCONDIDO HYDRO SUBUNIT 204F0				CARLSBAD HYDRO UNIT 20400													
12S/ 2W-21M 3 S	--	7.3	1960	150	74	160	5	0	223	102	507	12	0.5	0.03	37	1554	680
7- 3-63				7.49	6.09	6.96	0.13		3.65	2.12	14.30	0.19					
				36	29	34	1		18	10	71	1				1157	
12S/ 2W-21M 4 S	--	--	1961	--	--	--	--	--	--	--	420	--	--	0.18	--		
5- 3-51											11.84						
12S/ 2W-22J 1 S	--	7.7	1890	125	125	153	3	0	287	338	332	119	0.5	0.03	56	1489	827
7- 2-63				6.24	10.28	6.65	0.08		4.70	7.04	9.36	1.92					
				27	44	29			20	31	41	8				1393	
12S/ 2W-28H 1 S	71	7.6	1140	74	47	115	4	0	235	127	174	68	0.5	0.02	43	779	378
7- 2-63				3.69	3.87	5.00	0.10		3.85	2.64	4.91	1.10					
				29	31	39	1		31	21	39	9				768	
12S/ 2W-30N 1 S	--	7.6	1800	108	39	240	4	0	302	240	338	0	0.2	0.40	30	1250	430
10-18-62				5.39	3.21	10.44	0.10		4.95	5.00	9.53						
				28	17	55	1		25	26	49					1148	
12S/ 2W-31D 1 S	--	7.1	2400	176	79	270	2	0	397	298	494	0	0.2	0.48	30	1748	765
10-18-62				8.78	6.50	11.74	0.05		6.51	6.20	13.93						
				32	24	43			24	23	52					1545	
13S/ 3W- 5P 1 S	--	7.8	5600	417	202	675	6	0	428	889	1434	3.0	1.0	0.30	17	4593	1872
10-16-62				20.81	16.61	29.35	0.15		7.01	18.51	40.44	0.05					
				31	25	44			11	28	61					3855	
13S/ 3W- 7R 1 S	--	7.5	2500	174	98	290	3	0	498	330	494	0	0.4	0.38	16	1774	838
10-16-62				8.68	8.06	12.61	0.08		8.16	6.87	13.93						
				29	27	43			28	24	48					1651	
13S/ 3W- 9E 1 S	--	8.3	1020	45	48	117	1	4	342	89	59	120	0.2	0.20	22	692	310
12-19-63				2.25	3.95	5.09	0.03	0.13	5.61	1.85	1.66	1.94					
				20	35	45		1	50	17	15	17				674	
13S/ 3W-16D 1 S	--	7.0	4400	609	164	385	2	0	233	1696	751	0	0.8	0.20	26	4216	2196
10-18-62				30.39	13.49	16.74	0.05		3.82	35.31	21.18						
				50	22	28			6	59	35					3749	
13S/ 3W-16H 1 S	--	7.4	2300	105	66	295	3	0	276	173	558	0	0.4	0.28	23	1594	534
10-17-62				5.24	5.43	12.83	0.08		4.52	3.60	15.74						
				22	23	54			19	15	66					1359	
13S/ 3W-18B 1 S	70	7.9	1710	81	54	179	1	0	346	130	291	1.2	0.3	0.28	--		424
8-25-54				4.04	4.44	7.78	0.03		5.67	2.71	8.21	0.02				1008	
				25	27	48			34	16	49					908	
13S/ 3W-18B 2 S	--	7.0	2800	188	105	325	2	0	451	375	616	0	0.2	0.40	21	2180	902
10-16-62				9.38	8.64	14.13	0.05		7.39	7.81	17.37						
				29	27	44			23	24	53					1854	
13S/ 3W-19D 1 S	--	7.4	3600	174	84	562	14	0	575	437	760	36	1.0	0.63	29	2498	780
10-16-62				8.68	6.91	24.44	0.36		9.42	9.10	21.43	0.58					
				21	17	61	1		23	22	53	1				2380	
13S/ 3W-19D 2 S	--	7.6	2800	98	64	450	59	0	464	267	609	37	1.0	0.50	27	1838	508
10-16-62				4.89	5.26	19.57	1.51		7.60	5.56	17.17	0.60					
				16	17	63	5		25	18	56	2				1841	
13S/ 4W-23H 1 S	--	7.0	2700	136	81	350	5	0	205	395	613	7	0.8	0.43	--	1842	673
6-26-64				6.79	6.66	15.22	0.13		3.36	8.22	17.29	0.11					
				24	23	53			12	28	60					1689	
13S/ 4W-24N 1 S	--	7.0	2100	127	46	280	2	0	227	408	361	22.0	0.4	0.40	45	1574	506
10-16-62				6.34	3.78	12.17	0.05		3.72	8.49	10.18	0.35					
				28	17	54			16	37	45	2				1403	
13S/ 4W-24P 1 S	72	7.7	2213	71	2	373	6	0	39	254	505	2.5	2.1	3.20	--	1191	185
3-10-64				3.54	0.16	16.22	0.15		0.64	5.29	14.24	0.04					
				18	1	81	1		3	26	70					1238	
13S/ 4W-25C 1 S	--	7.4	4500	204	77	737	8	0	274	419	1265	6.0	1.0	1.58	23	3174	826
10-16-62				10.18	6.33	32.04	0.20		4.49	8.72	35.67	0.10					
				21	13	66			9	18	73					2876	
13S/ 4W-25J 1 S	--	8.0	3450	190	81	490	6	0	252	400	886	1.8	0.4	1.00	28	2462	808
12-18-63				9.48	6.66	21.31	0.15		4.13	8.33	24.99	0.03					
				25	18	57			11	22	67					2208	
13S/ 4W-25D 1 S	--	8.2	2300	65	7	500	4	0	41	272	630	81	2.0	0.45	12	1384	191
2- 8-63				3.24	0.58	21.74	0.10		0.67	5.66	17.77	1.31					
				13	2	85			3	22	70	5				1594	

SAN DIEGUITO HYDRO UNIT Z0500

SAN DIEGUITO HYDRO SUBUNIT Z05A0

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
13S/ 3W-23L 1 S	--	7.7	3900	364	41	456	6	0	31	1300	460	0	8.0	0.42	3	2700	1077
3-27-57				18.16	3.37	19.83	0.15		0.51	27.07	12.97						
				44	8	48			1	67	32					2654	
13S/ 3W-24R 1 S	69	7.5	2395	83	48	334	4	0	256	115	575	0	1.0	0.18	23	1400	405
3-12-57				4.14	3.95	14.52	0.10		4.20	2.39	16.22						
				18	17	64			18	10	71					1309	
13S/ 3W-28N 1 S	--	7.3	1773	116	59	157	3	0	268	104	380	1.1	0.4	0.05	37	974	532
1- 3-62				5.79	4.85	6.83	0.08		4.39	2.17	10.72	0.02					
				33	28	39			25	13	62					989	
13S/ 3W-28N 2 S	--	7.5	1525	120	50	150	3	0	275	167	314	0.0	0.2	0.15	--	942	505
3-26-65				5.99	4.11	6.52	0.08		4.51	3.48	8.85						
				36	25	39			27	21	53					940	
13S/ 3W-28P 1 S	--	7.6	1128	60	35	109	0	0	244	68	177	15.0	0.3	0.25	--	637	294
3-26-57				2.99	2.88	4.74			4.00	1.42	4.99	0.24					
				28	27	45			38	13	47	2				584	
13S/ 3W-32J 1 S	--	7.8	1485	90	43	134	7	0	180	339	151	3.9	0.6	0.13	--	930	402
3-26-57				4.49	3.54	5.83	0.18		2.95	7.06	4.26	0.06					
				32	25	42	1		21	49	30					857	
13S/ 3W-32R 1 S	70	7.9	1900	117	59	250	8	0	431	226	357	3	0.2	0.26	--	1290	535
3- 4-65				5.84	4.85	10.87	0.20		7.06	4.71	10.07	0.05					
				27	22	50	1		32	22	46					1232	
13S/ 3W-33B 1 S	--	7.5	1645	98	67	165	5	0	211	153	387	0.0	0.2	0.20	--	1246	520
3- 4-65				4.89	5.51	7.17	0.13		3.46	3.19	10.91						
				28	31	41	1		20	18	62					979	
13S/ 3W-33C 6 S	--	7.1	1989	122	68	102	--	0	268	390	340	--	--	0	16	1362	584
4-16-62				6.09	5.59	4.43			4.39	8.12	9.59						
13S/ 3W-33D 1 S	68	7.8	2200	124	60	320	8	0	318	456	353	0.0	0.2	0.21	--	1558	556
3-25-65				6.19	4.93	13.91	0.20		5.21	9.49	9.95						
				25	20	55	1		21	38	40					1478	
13S/ 3W-33E 2 S	68	7.9	2500	196	62	335	8	0	361	356	564	0.0	0.4	0.29	--	1786	745
3- 4-65				9.78	5.10	14.57	0.20		5.92	7.41	15.90						
				33	17	49	1		20	25	54					1699	
13S/ 3W-33F 2 S	66	7.4	1900	140	68	136	1	0	223	210	372	2.9	0.2	0.12	--	1190	630
3-26-57				6.99	5.59	5.91	0.03		3.65	4.37	10.49	0.05					
				38	30	32			20	24	57					1040	
13S/ 3W-33F 3 S	--	7.3	2500	196	87	186	5	0	207	251	568	0	0.5	0.06	29	1580	847
11-15-62				9.78	7.15	8.09	0.13		3.39	5.23	16.02						
				39	28	32	1		14	21	65					1424	
13S/ 3W-33F 4 S	69	7.7	3000	285	119	270	18	0	288	394	808	2	0.2	0.11	--	2350	1201
3- 4-65				14.22	9.79	11.74	0.46		4.72	8.20	22.79	0.03					
				39	27	32	1		13	23	64					2038	
13S/ 3W-33L 3 S	--	7.5	2560	214	98	272	16	0	337	397	599	0.0	0.1	0.15	--	1738	938
3-25-65				10.68	8.06	11.83	0.41		5.52	8.27	16.89						
				34	26	38	1		18	27	55					1762	
13S/ 3W-33L 6 S	--	7.7	1950	146	55	217	8	0	423	203	361	0.0	0.2	0.25	--	1250	591
3- 4-65				7.29	4.52	9.44	0.20		6.93	4.23	10.18						
				34	21	44	1		32	20	48					1198	
13S/ 3W-33M 1 S	67	7.8	3514	18	9	132	71	0	1830	1	184	3.1	0.4	0.20	--	560	82
3- 6-64				0.90	0.74	5.74	1.82		29.99	0.02	5.19	0.05					
				10	8	62	20		85		15					1319	
13S/ 3W-33Q 1 S	--	7.3	6200	429	184	1005	43	0	379	681	2089	0.0	0.4	0.53	--	4420	1828
3-25-65				21.41	15.13	43.70	1.10		6.21	14.18	58.91						
				26	19	54	1		8	18	74					4618	
13S/ 3W-33Q 3 S	66	7.5	3000	52	58	595	22	0	110	145	1011	0.0	0.2	0.26	--	1956	368
3- 4-65				2.59	4.77	25.87	0.56		1.80	3.02	28.51						
				8	14	77	2		5	9	86					1937	
13S/ 3W-34K 1 S	--	7.5	11890	974	364	1500	10	0	207	2106	3400	7.5	1.5	0.88	12	10460	3930
1-11-63				48.60	29.94	65.22	0.26		3.39	43.85	95.88	0.12					
				34	21	45			2	31	67					8478	
14S/ 3W- 2D 1 S	--	7.2	1110	68	24	125	3	0	152	115	221	0	0.4	0.20	22	702	268
8-10-62				3.39	1.97	5.44	0.08		2.49	2.39	6.23						
				31	18	50	1		22	22	56					653	
14S/ 3W- 2Q 2 S	--	7.2	8696	637	464	800	2	0	388	1534	2300	0	1.2	0.54	24		3500
1-10-63				31.79	38.16	34.78	0.05		6.36	31.94	64.86					7545	
				30	36	33			6	31	63					5953	
14S/ 3W- 3D 1 S	--	7.2	6200	611	216	780	7	0	251	898	2089	0.0	0.6	0.77	--	5160	2414
3- 4-65				30.49	17.76	33.91	0.18		4.11	18.70	58.91						
				37	22	41			5	23	72					4726	

SAN DIEGUITO HYDRO UNIT 20500

SAN DIEGUITO HYDRO SUBUNIT 205A0

State well number	Temp. when sampled	pH	Specific conductance	Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
Date sampled	in °F		(micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C Evap 105°C Computed	Total hardness as $CaCO_3$
14S/ 3W- 4N 1 S	--	7.7	2700	222	86	285	3	0	269	301	684	7	0.4	0.40	--	2010	908
3- 4-65				11.08	7.07	12.39	0.08		4.41	6.27	19.29	0.11					
				36	23	40			15	21	64					1721	
14S/ 3W- 4P 1 S	--	7.2	4400	477	141	420	2	0	332	664	1181	18	0.2	0.37	--	3600	1771
3- 4-65				23.80	11.60	18.26	0.05		5.44	13.82	33.30	0.29					
				44	22	34			10	26	63	1				3067	
14S/ 3W- 5F 1 S	--	7.5	3000	152	85	515	41	0	553	800	442	0.0	1.0	0.63	--	2196	729
3-19-65				7.58	6.99	22.39	1.05		9.06	16.66	12.46						
				20	18	59	3		24	44	33					2309	
14S/ 3W- 5K 2 S	--	7.5	5000	325	106	730	33	0	243	573	1450	0.0	0.1	0.87	--	3610	1248
3- 3-65				16.22	8.72	31.74	0.84		3.98	11.93	40.89						
				28	15	55	1		7	21	72					3337	
14S/ 3W- 5N 1 S	--	7.8	3000	108	33	570	31	0	480	210	762	0.0	0.2	0.60	--	1848	405
3-19-65				5.39	2.71	24.78	0.79		7.87	4.37	21.49						
				16	8	74	2		23	13	64					1951	
14S/ 3W- 6P 1 S	--	8.0	12400	273	224	3400	70	0	1479	889	4820	2	0.1	3.50	--	9408	1603
3-18-65				13.62	18.42	147.83	1.79		24.24	18.51	135.92	0.03					
				7	10	81	1		14	10	76					10409	
14S/ 3W- 6P 2 S	66	7.4	3360	100	56	513	9	0	336	246	775	6.5	0.6	0.63	--	1960	480
3-26-57				4.99	4.61	22.31	0.23		5.51	5.12	21.66	0.10					
				16	14	69	1		17	16	67					1872	
14S/ 3W- 7C 1 S	70	8.0	7700	291	96	1700	23	0	1170	877	2163	0	1.0	2.60	26	5708	1122
11-12-62				14.52	7.90	73.92	0.59		19.18	18.26	61.00						
				15	8	76	1		19	19	62					5755	
14S/ 3W- 7C 2 S	64	7.8	11100	294	298	1918	43	0	782	788	3320	9.3	1.0	1.40	--	7501	1961
3-11-64				14.67	24.51	83.39	1.10		12.82	16.41	93.62	0.15					
				12	20	67	1		10	13	76					7057	
14S/ 3W- 7C 3 S	--	7.7	8000	206	133	1820	50	0	964	610	2550	2	0.4	1.85	--	5620	1062
2-26-65				10.28	10.94	79.13	1.28		15.80	12.70	71.91	0.03					
				10	11	78	1		16	13	72					5847	
14S/ 3W- 7C 4 S	60	7.5	9450	204	153	1890	47	0	1066	703	2645	7	1.2	2.04	29	6665	1139
2- 1-62				10.18	12.58	82.18	1.20		17.47	14.64	74.59	0.11					
				10	12	77	1		16	14	70					6205	
14S/ 3W- 7C 6 S	68	8.2	9200	164	129	2250	75	0	1027	832	3041	0.0	0.8	2.00	--	7102	940
3-18-65				8.18	10.61	97.83	1.92		16.83	17.32	85.76						
				7	9	83	2		14	14	72					6999	
14S/ 3W- 7E 1 S	--	7.5	5310	73	61	968	8	0	665	272	1262	12.8	0.8	1.25	--	3081	433
3-26-57				3.64	5.02	42.09	0.20		10.90	5.66	35.59	0.21					
				7	10	83			21	11	68					2986	
14S/ 3W- 7E 2 S	68	7.5	5000	170	109	980	20	0	228	724	1450	0.0	0.8	3.50	--	3610	873
3-17-65				8.48	8.96	42.61	0.51		3.74	15.07	40.89						
				14	15	70	1		6	25	68					3569	
14S/ 3W- 7J 1 S	--	7.7	725	54	16	88	1	0	215	60	103	4	0.2	0.28	--	440	201
3- 1-65				2.69	1.32	3.83	0.03		3.52	1.25	2.90	0.06					
				34	17	49			46	16	38	1				432	
14S/ 3W- 7K 1 S	--	7.4	2650	218	60	285	6	0	296	478	455	0	0.6	0.20	25	1750	791
3-26-57				10.88	4.93	12.39	0.15		4.85	9.95	12.83						
				38	17	44	1		18	36	46					1673	
14S/ 3W- 7L 1 S	--	8.0	2225	196	35	305	6	0	81	145	741	1	0.1	0.25	--	1496	634
3-24-65				9.78	2.88	13.26	0.15		1.33	3.02	20.90	0.02					
				38	11	51	1		5	12	83					1469	
14S/ 3W- 7L 4 S	--	7.4	2450	214	63	280	8	0	300	478	486	0.0	0.4	0.50	--	1820	794
3- 1-65				10.68	5.18	12.17	0.20		4.92	9.95	13.71						
				38	18	43	1		17	35	48					1677	
14S/ 3W- 7L 5 S	--	7.2	2800	341	70	263	7	0	309	631	560	0.0	0.4	0.48	--	2190	1140
3- 1-65				17.02	5.76	11.44	0.18		5.06	13.14	15.79						
				49	17	33	1		15	39	46					2025	
14S/ 3W- 7M 1 S	--	7.4	2960	54	43	506	3	0	317	310	615	0	2.0	0.34	16	1810	312
3-26-57				2.69	3.54	22.00	0.08		5.20	6.45	17.34						
				10	13	78			18	22	60					1705	
14S/ 3W- 7M 3 S	62	8.0	3500	222	115	545	38	0	377	514	972	6	1.0	1.00	--	2758	1028
3- 1-65				11.08	9.46	23.70	0.97		6.18	10.70	27.41	0.10					
				25	21	52	2		14	24	62					2599	
14S/ 3W- 7P 1 S	--	7.8	1950	118	32	300	12	0	190	121	568	1	0.1	0.50	--	1450	426
3- 1-65				5.89	2.63	13.04	0.31		3.11	2.52	16.02	0.02					
				27	12	60	1		14	12	74					1246	
14S/ 3W- 7P 4 S	--	7.4	1925	174	43	190	5	0	91	91	571	11	0.2	0.28	--	1490	611
3- 2-65				8.68	3.54	8.26	0.13		1.49	1.89	16.10	0.18					
				42	17	40	1		8	10	82	1				1130	

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C Evap 105°C Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
SAN DIEGUITO HYDRO UNIT Z0500																	
SAN DIEGUITO HYDRO SUBUNIT Z05A0																	
14S/ 3W- 7P 6 S	--	7.9	1900	120	58	230	14	0	348	199	390	0.0	0.1	0.45	--	1236	538
3- 2-65				5.99	4.77	10.00	0.36		5.70	4.14	11.00						
				28	23	47	2		27	20	53					1183	
14S/ 3W- 8M 1 S	66	7.3	915	65	20	91	2	0	223	54	140	3.8	0.6	0.10	27	588	244
3-26-57				3.24	1.64	3.96	0.05		3.65	1.12	3.95	0.06					
				36	18	45	1		42	13	45	1				513	
14S/ 3W- 8M 2 S	--	7.0	425	19	6	74	1	0	84	25	80	24	0.2	0.17	--	304	72
3- 1-65				0.95	0.49	3.22	0.03		1.38	0.52	2.26	0.39					
				20	10	69	1		30	11	50	9				271	
14S/ 3W-10B 1 S	60	8.1	4016	239	77	545	6	0	309	688	785	0.5	0.5	0.72	10	2670	914
3-27-58				11.93	6.33	23.70	0.15		5.06	14.32	22.14	0.01					
				28	15	56			12	34	53					2504	
14S/ 3W-17C 2 S	68	7.7	2000	79	21	363	4	0	281	296	372	0	0.6	1.13	14	1280	284
8-23-62				3.94	1.73	15.78	0.10		4.61	6.16	10.49						
				18	8	73			22	29	49					1289	
14S/ 4W- 1K 1 S	70	7.8	2250	132	9	394	9	0	111	297	577	0.0	0.8	2.46	--	1474	367
2-25-65				6.59	0.74	17.13	0.23		1.82	6.18	16.27						
				27	3	69	1		7	25	67					1476	
14S/ 4W- 1P 1 S	--	8.0	2350	161	74	632	12	0	204	388	1065	60	0.7	0.44	28	1677	707
8- 4-59				8.03	6.09	27.48	0.31		3.34	8.08	30.03	0.97					
				19	15	66	1		8	19	71	2				2521	
14S/ 4W- 1P 2 S	--	7.3	5570	197	170	718	12	0	143	730	1397	8.5	0.8	2.00	--	3665	1191
3-25-57				9.83	13.98	31.22	0.31		2.34	15.20	39.40	0.14					
				18	25	56	1		4	27	69					3306	
14S/ 4W- 1Q 1 S	--	7.3	19500	942	287	5100	120	0	138	1436	9170	0.0	0.8	5.25	--	17400	3533
3-24-65				47.01	23.60	221.75	3.07		2.26	29.90	258.59						
				16	8	75	1		1	10	89					17129	
14S/ 4W- 1R 4 S	70	7.4	4500	375	32	835	35	0	137	842	1344	0.0	1.0	2.26	--	3482	1068
3-17-65				18.71	2.63	36.31	0.89		2.25	17.53	37.90						
				32	4	62	2		4	30	66					3534	
14S/ 4W-11J 2 S	--	7.9	28000	3186	294	5200	70	0	64	1340	13634	0.0	0.1	12.70	--	27402	9165
2-25-65				158.98	24.18	226.10	1.79		1.05	27.90	384.48						
				39	6	55				7	93					23768	
14S/ 4W-12B 1 S	--	8.5	8300	111	141	1675	43	9	107	600	2695	0	0.6	1.47	21	5240	858
8-21-63				5.54	11.60	72.83	1.10	0.30	1.75	12.49	76.00						
				6	13	80	1		2	14	84					5350	
14S/ 4W-12H 1 S	68	4.4	25000	393	550	6020	140	0	0	2536	9750	0.0	0.4	3.82	--	19360	3245
3-17-65				19.61	45.23	261.75	3.58			52.80	274.95						
				6	14	79	1			16	84					19393	
14S/ 4W-12L 1 S	68	7.9	6700	326	34	1450	58	0	416	7	2669	0	0.2	1.00	2	5410	954
11-14-62				16.27	2.80	63.05	1.48		6.82	0.15	75.27						
				19	3	75	2		8		92					4752	
12S/ 2W-24F 2 S	68	7.3	1302	97	66	104	3	--	243	209	163	109.7	0.2	0.10	60	934	514
3-26-57				4.84	5.43	4.52	0.08		3.98	4.35	4.60	1.77					
				33	37	30	1		27	30	31	12				931	
12S/ 2W-24R 3 S	62	7.8	1197	47	49	120	1	0	172	167	141	95.4	0.6	0.10	60	821	319
3-26-57				2.35	4.03	5.22	0.03		2.82	3.48	3.98	1.54					
				20	35	45			24	29	34	13				766	
12S/ 2W-26H 3 S	68	7.3	1035	57	38	92	4	0	192	131	110	55	0.4	0.10	32	660	299
3-26-57				2.84	3.13	4.00	0.10		3.15	2.73	3.10	0.89					
				28	31	40	1		32	28	31	9				614	
12S/ 2W-26J 2 S	65	7.1	1067	59	36	107	3	0	234	119	115	49	0.4	0	50	672	295
3-26-57				2.94	2.96	4.65	0.08		3.84	2.48	3.24	0.79					
				28	28	44	1		37	24	31	8				653	
12S/ 2W-26P 2 S	68	7.2	1360	86	52	104	4	0	241	110	158	130	0.2	0	26	880	429
3- 5-57				4.29	4.28	4.52	0.10		3.95	2.29	4.46	2.10					
				33	32	34	1		31	18	35	16				791	
12S/ 2W-27J 2 S	70	7.3	1635	100	65	121	7	0	265	104	260	91	0.5	0	30	1000	517
4- 8-57				4.99	5.35	5.26	0.18		4.34	2.17	7.33	1.47					
				32	34	33	1		28	14	48	10				909	
12S/ 2W-27N 3 S	70	7.2	760	37	24	81	2	0	125	74	105	46	0.7	0.02	37	480	191
4- 8-57				1.85	1.97	3.52	0.05		2.05	1.54	2.96	0.74					
				25	27	48	1		28	21	41	10				468	
12S/ 2W-33Q 1 S	--	7.4	840	35	35	77	5	0	206	36	142	6	0.2	0.08	--	468	232
6-24-64				1.75	2.88	3.35	0.13		3.38	0.75	4.00	0.10					
				22	36	41	2		41	9	49	1				437	

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million, equivalents per million, percent reactance value									Chemical constituents in parts per million				

SAN DIEGUITO HYDRO UNIT 20500

HODGES HYDRO SUBUNIT 20580

State well number / Date sampled	Temp.	pH	Sp. cond.	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F	B	SiO_2	TDS	Total hardness
12S/ 2W-34M 2 S	69	7.6	960	56	30	89	4	0	177	54	145	62	0.7	0	33	600	263
4- 8-57				2.79	2.47	3.87	0.10		2.90	1.12	4.09	1.00					
				30.	27	42	1		32	12	45	11				561	
13S/ 2W- 1J 1 S	68	7.1	1310	95	45	102	2	0	275	208	152	0	0.7	0	28	866	422
4- 5-57				4.74	3.70	4.43	0.05		4.51	4.33	4.29						
				37	29	34			34	33	33					768	
13S/ 2W- 1R 1 S	--	7.7	853	83	31	75	5	0	264	140	93	2.0	0.8	0.10	--		335
7-10-53				4.14	2.55	3.26	0.13		4.33	2.91	2.62	0.03				587	
				41	25	32	1		44	29	26					560	
13S/ 2W- 1R 2 S	66	7.1	2052	278	40	185	4	0	310	543	319	1.3	0.1	0.32	30	1596	859
11-19-63				13.87	3.29	8.04	0.10		5.08	11.31	9.00	0.02					
				55	13	32			20	45	35					1553	
13S/ 2W- 20S2 S	57	8.2	1740	96	49	171	3	0	308	185	266	17.8	0.5	0.08	--	1027	441
2-15-57				4.79	4.03	7.44	0.08		5.05	3.85	7.50	0.29					
				29	25	46			30	23	45	2				940	
13S/ 2W- 20S3 S	57	8.2	41740	111	61	161	1	0	336	176	278	43.9	0.5	0.12	--	1093	528
2-15-57				5.54	5.02	7.00	0.03		5.51	3.66	7.84	0.71					
				31	29	40			31	21	44	4				998	
13S/ 2W- 2L 1 S	67	7.6	820	43	27	73	3	0	143	27	153	21	0.4	0	31	498	219
4- 5-57				2.15	2.22	3.17	0.08		2.34	0.56	4.31	0.34					
				28	29	42	1		31	7	57	5				449	
13S/ 2W-11R 1 S	71	7.1	1453	112	54	121	4	0	321	212	208	1.3	0.2	0.22	24		502
8-18-60				5.59	4.44	5.26	0.10		5.26	4.41	5.87	0.02				1038	
				36	29	34	1		34	28	38					895	
13S/ 2W-12L 1 S	70	7.0	1450	94	46	146	3	0	267	166	242	3.4	0.4	0.19	30		424
7-20-61				4.69	3.78	6.35	0.08		4.38	3.46	6.82	0.05				926	
				31	25	43	1		30	24	46					862	
13S/ 2W-12N 1 S	68	7.5	1010	67	34	127	4	0	250	110	181	0	0.4	0.20	33	696	307
11-19-63				3.34	2.80	5.52	0.10		4.10	2.29	5.10						
				28	24	47	1		36	20	44					680	
13S/ 2W-12N 6 S	72	7.3	1256	64	34	137	6	0	226	78	243	4	0.6	0.22	27		300
8-18-60				3.19	2.80	5.96	0.15		3.70	1.62	6.85	0.06				848	
				26	23	49	1		30	13	56					705	

SAN PASQUAL HYDRO SUBUNIT 205C0

State well number / Date sampled	Temp.	pH	Sp. cond.	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F	B	SiO_2	TDS	Total hardness
12S/ 1W- 5N 1 S	75	6.9	653	23	13	94	0	0	127	22	139	4.5	0.4	0.05	60	410	111
8-20-62				1.15	1.07	4.09			2.08	0.46	3.92	0.07					
				18	17	65			32	7	60	1				418	
12S/ 1W-20L 1 S	69	7.1	895	47	25	97	2	0	214	56	140	0	0.7	0	31	570	221
4- 5-57				2.35	2.06	4.22	0.05		3.51	1.17	3.95						
				27	24	49	1		41	14	46					504	
12S/ 1W-30A 1 S	69	7.3	1136	66	35	119	4	0	270	78	180	1.2	0.5	0.06	40	721	309
3-26-57				3.29	2.88	5.17	0.10		4.43	1.62	5.08	0.02					
				29	25	45	1		40	15	46					656	
12S/ 1W-30R 1 S	68	7.5	2012	86	51	264	2	0	359	127	392	0	1.0	0.20	50	1217	424
3-26-57				4.29	4.19	11.48	0.05		5.88	2.64	11.05						
				21	21	57			30	13	56					1150	
12S/ 1W-31H 1 S	--	7.7	1310	103	44	158	2	0	385	82	260	3.4	0.2	0.14	36	862	438
11-19-63				5.14	3.62	6.87	0.05		6.31	1.71	7.33	0.05					
				33	23	44			41	11	48					878	
12S/ 1W-32B 1 S	--	7.4	770	44	18	104	2	0	196	38	132	21	0.4	0.16	39	296	184
11-19-63				2.20	1.48	4.52	0.05		3.21	0.79	3.72	0.34					
				27	18	55	1		40	10	46	4				495	
12S/ 1W-32E 1 S	--	7.9	1340	85	49	175	2	0	375	79	299	5.0	0.2	0.12	38	886	414
11-19-63				4.24	4.03	7.61	0.05		6.15	1.64	8.43	0.08					
				27	25	48			38	10	52					917	
12S/ 1W-32G 1 S	--	7.1	1509	82	40	179	3	0	275	74	290	29	1.0	0.50	34	1015	369
4-25-62				4.09	3.29	7.78	0.08		4.51	1.54	8.18	0.47					
				27	22	51	1		31	10	56	3				868	
12S/ 1W-33E 1 S	58	7.6	930	52	30	98	1	0	217	62	148	27.0	0.3	0.06	40	570	253
3-28-58				2.59	2.47	4.26	0.03		3.56	1.29	4.17	0.44					
				28	26	46			38	14	44	5				565	
12S/ 1W-34J 1 S	67	7.2	885	70	34	71	2	0	326	86	72	0.2	0.1	0.02	40	539	315
3-25-57				3.49	2.80	3.09	0.05		5.34	1.79	2.03						
				37	30	33	1		58	20	22					536	
12S/ 1W-34P 1 S	68	7.7	800	54	45	87	2	0	328	97	95	5.8	0.2	0.11	36	608	320
11-19-63				2.69	3.70	3.78	0.05		5.38	2.02	2.68	0.09					
				26	36	37			53	20	26	1				583	

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million, equivalents per million, percent reactance value									Chemical constituents in parts per million				
SAN DIEGUITO HYDRO UNIT 20500																	
SAN PASQUAL HYDRO SUBUNIT 205C0																	
12S/ 1W-35B 2 S	61	7.5	480	34	19	39	2	0	169	39	44	2.3	0.2	0.03	35	323	163
3-26-57				1.70	1.56	1.70	0.05		2.77	0.81	1.24	0.04					
				34	31	34	1		57	17	26	1				298	
12S/ 1W-35D 2 S	68	7.7	628	35	21	64	2	0	237	26	70	0	0.2	0.06	40	381	174
3-25-57				1.75	1.73	2.78	0.05		3.88	0.54	1.97						
				28	27	44	1		61	8	31					375	
12S/ 1W-35H 1 S	66	7.3	618	47	24	45	2	0	214	44	67	13	0.2	0.05	33		216
7-20-61				2.35	1.97	1.96	0.05		3.51	0.92	1.89	0.21				388	
				37	31	31	1		54	14	29	3				380	
12S/ 1W-35H 2 S	62	7.8	955	72	50	100	4	0	342	46	103	19	0.6	0.14	--	552	385
2- 3-60				3.59	4.11	4.35	0.10		5.61	0.96	2.90	0.31					
				30	34	36	1		57	10	30	3				563	
12S/ 1W-35L 3 S	68	7.0	916	59	44	75	3	0	265	62	108	66.5	0.3	0.03	50	661	328
3-26-57				2.94	3.62	3.26	0.08		4.34	1.29	3.05	1.07					
				30	37	33	1		45	13	31	11				598	
12S/ 1W-36G 1 S	62	7.1	591	41	22	45	2	0	169	49	69	0.6	0.2	0.03	30	379	193
3-26-57				2.05	1.81	1.96	0.05		2.77	1.02	1.95	0.01					
				35	31	33	1		48	18	34					342	
13S/ 1W- 3E 1 S	69	7.5	1107	71	43	109	2	0	415	71	117	1.0	0.5	0.05	40	673	354
3-26-57				3.54	3.54	4.74	0.05		6.80	1.48	3.30	0.02					
				30	30	40			59	13	28					659	
13S/ 1W- 5A 1 S	58	7.3	2583	124	76	330	2	0	587	147	454	53.9	0.5	0.15	40	1589	622
3-26-57				6.19	6.25	14.35	0.05		9.62	3.06	12.80	0.87					
				23	23	53			37	12	49	3				1516	
SANTA MARIA VALLEY HYDRO SUBUNIT 20500																	
12S/ 1E-36N 1 S	--	7.4	430	27	8	44	--	0	142	20	40	3.2	--	--	44	264	101
4-29-63				1.35	0.66	1.91			2.33	0.42	1.13	0.05					
				34	17	49			59	11	29	1				256	
12S/ 1E-36P 1 S	--	7.4	588	38	16	49	--	0	185	26	60	--	--	0	46	384	161
4-23-63				1.90	1.32	2.13			3.03	0.54	1.69						
12S/ 2E-32G 1 S	--	7.7	440	27	16	35	2	0	160	12	40	16	0.4	0	34	294	134
4- 8-57				1.35	1.32	1.52	0.05		2.62	0.25	1.13	0.26					
				32	31	36	1		62	6	27	6				261	
12S/ 2E-33P 1 S	75	8.1	295	24	10	22	4	0	135	14	20	3.6	0.2	0.02	--	176	101
6-16-64				1.20	0.82	0.96	0.10		2.21	0.29	0.56	0.06					
				39	27	31	3		71	9	18	2				164	
13S/ 1E- 3H 2 S	70	7.1	525	20	16	62	2	0	142	15	74	12.5	0.3	0.05	50	332	116
3-26-57				1.00	1.32	2.70	0.05		2.33	0.31	2.09	0.20					
				20	26	53	1		47	6	42	4				322	
13S/ 1E-11M 1 S	--	7.7	930	47	24	143	2	0	296	37	164	8.0	0.6	0.16	43	562	216
11-20-63				2.35	1.97	6.22	0.05		4.85	0.77	4.62	0.13					
				22	19	59			47	7	45	1				614	
13S/ 1E-15E 2 S	70	7.5	795	39	22	84	3	0	149	22	143	48	0.4	0	32	490	188
3-26-57				1.95	1.81	3.65	0.08		2.44	0.46	4.03	0.77					
				26	24	49	1		32	6	52	10				467	
13S/ 1E-15M 1 S	--	7.9	1840	105	55	288	3	0	563	167	348	8.4	0.6	0.30	35	1238	488
11-20-63				5.24	4.52	12.52	0.08		9.23	3.48	9.81	0.14					
				23	20	56			41	15	43	1				1287	
13S/ 1E-16P 1 S	65	7.2	1740	68	39	219	5	0	357	76	303	21	0.6	0.04	23	1040	330
4- 5-57				3.39	3.21	9.52	0.13		5.85	1.58	8.54	0.34					
				21	20	59	1		36	10	52	2				930	
13S/ 1E-17J 2 S	--	7.7	900	64	36	105	5	0	137	294	92	0	0.2	0.09	7	780	308
11-20-63				3.19	2.96	4.57	0.13		2.25	6.12	2.59						
				29	27	42	1		21	56	24					671	
13S/ 1E-17L 1 S	69	7.6	1083	34	23	140	3	0	124	27	228	47	0.8	0.02	--		180
8-27-54				1.70	1.89	6.09	0.08		2.03	0.56	6.43	0.76				655	
				17	19	62	1		21	6	66	8				564	
13S/ 1E-17N 1 S	--	7.9	1135	53	45	94	2	0	123	28	250	38	1.0	0.02	31	644	317
4- 6-57				2.64	3.70	4.09	0.05		2.02	0.58	7.05	0.61					
				25	35	39			20	6	69	6				602	
13S/ 1E-23B 1 S	68	7.4	615	34	19	60	4	0	165	16	85	26.6	0.3	0.04	40	382	163
3-26-57				1.70	1.56	2.61	0.10		2.70	0.33	2.40	0.43					
				28	26	44	2		46	6	41	7				366	
13S/ 1E-27K 1 S	64	7.6	840	30	23	110	4	0	139	42	180	1.0	0.7	0.03	25	512	170
3-26-57				1.50	1.89	4.78	0.10		2.28	0.87	5.08	0.02					
				18	23	58	1		28	11	62					484	

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				

SAN DIEGUITO HYDRO UNIT 20500

SANTA MARIA VALLEY HYDRO SUBUNIT 20500

State well number / Date sampled	Temp.	pH	Spec. cond.	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F	B	SiO_2	TDS	Total hardness
13S/ 1E-29P 1 S	68	7.7	591	33	15	60	2	0	137	13	106	1.3	0.4	0	25	365	144
3-26-57				1.65	1.23	2.61	0.05		2.25	0.27	2.99	0.02					
				30	22	47	1		41	5	54					323	
13S/ 2E- 4H 1 S	73	7.7	390	26	18	27	2	0	156	16	27	18	0.2	0.15	--	260	139
6-16-64				1.30	1.48	1.17	0.05		2.56	0.33	0.76	0.29					
				33	37	29	1		65	8	19	7				211	
13S/ 2E- 9H 1 S	64	7.2	630	41	25	52	2	0	218	41	70	0	0.4	0	36	412	206
4- 8-57				2.05	2.06	2.26	0.05		3.57	0.85	1.97						
				32	32	35	1		56	13	31					375	
13S/ 2E- 9N 1 S	66	7.0	1045	67	37	100	3	0	317	57	133	20	0.6	0	35	700	319
4- 8-57				3.34	3.04	4.35	0.08		5.20	1.19	3.75	0.32					
				31	28	40	1		50	11	36	3				608	
13S/ 2E-11C 1 S	68	7.2	450	22	15	46	5	0	140	37	50	2.6	0.4	0	34	296	117
4- 8-57				1.10	1.23	2.00	0.13		2.29	0.77	1.41	0.04					
				25	28	45	3		51	17	31	1				281	
13S/ 2E-17C 1 S	68	6.9	665	36	19	62	2	0	180	25	65	45	0.7	0	34	400	168
4- 8-57				1.80	1.56	2.70	0.05		2.95	0.52	1.83	0.73					
				29	26	44	1		49	9	30	12				377	
13S/ 1W-12R 1 S	--	7.6	879	55	37	66	2	0	203	56	124	45	0.3	0.11	64	560	289
2- 2-60				2.74	3.04	2.87	0.05		3.33	1.17	3.50	0.73					
				31	35	33	1		38	13	40	8				549	
13S/ 1W-24R 1 S	--	6.8	680	34	20	62	2	0	58	12	140	51	0.1	0.02	40	449	167
4-24-62				1.70	1.64	2.70	0.05		0.95	0.25	3.95	0.82					
				28	27	44	1		16	4	66	14				390	
13S/ 1W-24R 2 S	--	7.1	500	20	14	52	2	0	49	20	98	30	0.1	0.01	25	296	108
3-27-57				1.00	1.15	2.26	0.05		0.80	0.42	2.76	0.48					
				22	26	51	1		18	9	62	11				285	

SANTA YSABEL HYDRO SUBUNIT 205C0

State well number / Date sampled	Temp.	pH	Spec. cond.	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F	B	SiO_2	TDS	Total hardness
11S/ 1E-35P 2 S	64	8.0	442	40	16	30	2	0	181	39	33	0	0.2	0.05	30	279	166
3-26-57				2.00	1.32	1.30	0.05		2.97	0.81	0.93						
				43	28	28	1		63	17	20					279	
11S/ 2E-21KS1 S	--	7.8	489	42	33	16	1	0	286	--	17	0.6	--	0.06	--		241
11- 4-52				2.10	2.71	0.70	0.03		4.69		0.48	0.01					
11S/ 2E-25NS1 S	60	7.0	191	14	5	17	4	--	72	--	14	1.9	--	0.46	--		56
11- 6-52				0.70	0.41	0.74	0.10		1.18		0.39	0.03					
11S/ 2E-34R 1 S	--	7.3	411	40	15	23	1	0	160	33	33	0	0.1	0.16	35	294	162
11-30-58				2.00	1.23	1.00	0.03		2.62	0.69	0.93						
				47	29	23	1		62	16	22					259	
11S/ 2E-35B 1 S	--	7.4	435	49	16	19	6	0	224	22	16	0	0.2	0.03	36	290	189
10-13-63				2.45	1.32	0.83	0.15		3.67	0.46	0.45						
				52	28	17	3		80	10	10					274	
11S/ 2E-35CS1 S	--	7.6	533	61	22	23	2	0	281	20	31	0	0	0.44	43	409	243
11-28-58				3.04	1.81	1.00	0.05		4.61	0.42	0.87						
				52	31	17	1		78	7	15					341	
11S/ 2E-35C 2 S	--	7.5	405	46	14	21	2	0	224	6	19	1.0	0.2	0.06	52	300	173
9-24-61				2.30	1.15	0.91	0.05		3.67	0.12	0.54	0.02					
				52	26	21	1		84	3	12					271	
12S/ 1E-11L 1 S	64	7.8	630	48	23	49	2	0	206	54	66	0.4	0.2	0.06	30	336	215
3-26-57				2.40	1.89	2.13	0.05		3.38	1.12	1.86	0.01					
				37	29	33	1		53	18	29					374	
12S/ 1E-11P 1 S	--	7.0	805	62	25	62	2	0	222	115	73	6.2	0.2	0.10	--		258
8- 6-53				3.09	2.06	2.70	0.05		3.64	2.39	2.06	0.10				470	
				39	26	34	1		44	29	25	1				455	
12S/ 2E- 3BS2 S	--	7.2	168	12	5	12	2	0	64	5	12	7.4	0.3	0.02	39	93	51
8- 9-62				0.60	0.41	0.52	0.05		1.05	0.10	0.34	0.12					
				38	26	33	3		65	6	21	7				126	
12S/ 2E-10GS3 S	--	7.5	268	20	9	22	4	0	118	--	10	2.4	--	0.05	--		87
11- 5-52				1.00	0.74	0.96	0.10		1.93		0.28	0.04					
12S/ 2E-13Q 1 S	--	7.7	342	27	7	32	4	0	134	--	28	0.4	--	0.06	--		97
11- 6-52				1.35	0.58	1.39	0.10		2.20		0.79	0.01					
12S/ 3E-16C 1 S	57	6.7	370	25	14	27	1	0	108	31	37	4.7	0.2	0.03	40	274	120
3-26-57				1.25	1.15	1.17	0.03		1.77	0.65	1.04	0.08					
				35	32	33	1		50	18	29	2				233	

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million, equivalents per million, percent reactance value									Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C Evap 105°C Computed	Total hardness as $CaCO_3$
						SAN DIEGUITO HYDRO UNIT					20500						
SANTA YSABEL HYDRO SUBUNIT				Z05E0													
12S/ 3E-28C 1 S	53	7.4	380	29	12	25	3	0	145	10	30	5	0.1	0	282	230	122
3-26-57				1.45	0.99	1.09	0.08		2.38	0.21	0.85	0.08					
				40	27	30	2		68	6	24	2				467	
12S/ 3E-31N 1 S	70	7.7	755	61	30	48	4	0	130	80	99	72	0.2	0.05	--	478	276
6-16-64				3.04	2.47	2.09	0.10		2.13	1.67	2.79	1.16					
				39	32	27	1		27	22	36	15				458	
						PENASQUITO HYDRO UNIT					Z0600						
SOLEDAD HYDRO SUBUNIT				Z06A0													
14S/ 3W-16Q 1 S	--	7.4	2366	131	68	239	5	0	124	252	550	0	0	0.40	3	1418	607
8- 4-59				6.54	5.59	10.39	0.13		2.03	5.25	15.51						
				29	25	46	1		9	23	68					1309	
14S/ 3W-17E 1 S	70	7.5	5400	412	14	825	16	0	48	821	1461	0	0.6	2.00	9	4076	1086
8-23-62				20.56	1.15	35.87	0.41		0.79	17.09	41.20						
				35	2	62	1		1	29	70					3584	
14S/ 3W-17L 2 S	--	7.6	2857	302	60	260	6	0	351	600	468	2.5	0.8	0.24	34	1940	1001
12- 4-63				15.07	4.93	11.30	0.15		5.75	12.49	13.20	0.04					
				48	16	36			18	40	42					1906	
14S/ 3W-18F 1 S	--	7.6	2400	286	11	210	5	0	155	208	620	0	0.6	0.25	28	1824	759
8-22-62				14.27	0.90	9.13	0.13		2.54	4.33	17.48						
				58	4	37	1		10	18	72					1445	
14S/ 3W-18F 2 S	69	7.7	2695	239	67	258	7	0	237	555	472	16	1.0	0.24	31	1760	873
12- 4-62				11.93	5.51	11.22	0.18		3.88	11.56	13.31	0.26					
				41	19	39	1		13	40	46	1				1763	
14S/ 3W-18K 1 S	--	7.5	2775	265	78	270	6	0	341	--	465	0	0.6	0.29	20	2188	982
8-21-61				13.22	6.41	11.74	0.15		5.59		13.11						
14S/ 3W-18L 1 S	--	7.1	2620	247	66	260	6	0	296	--	539	0	0.6	0.20	20	2088	889
8-22-62				12.33	5.43	11.30	0.15		4.85		15.20						
14S/ 3W-18L 3 S	--	7.0	3220	240	92	305	6	0	206	--	851	0	0.1	0.20	24	2206	978
8-23-62				11.98	7.57	13.26	0.15		3.38		24.00						
14S/ 3W-18L 4 S	--	7.3	2600	241	77	260	6	0	327	--	431	0	0.6	0.26	18	2052	919
8-24-62				12.03	6.33	11.30	0.15		5.36		12.15						
14S/ 3W-18L 5 S	--	7.5	2640	246	74	270	6	0	327	--	465	0	0.6	0.20	18	1992	919
8-24-62				12.28	6.09	11.74	0.15		5.36		13.11						
14S/ 3W-18L 6 S	--	7.7	1115	67	31	126	5	0	122	294	117	1.0	0.6	0.15	2	730	295
8-16-62				3.34	2.55	5.48	0.13		2.00	6.12	3.30	0.02					
				29	22	48	1		17	53	29					704	
14S/ 3W-18M 1 S	--	7.1	3614	252	77	370	14	0	183	214	1000	0	0.3	0.22	30	2750	946
8-15-62				12.57	6.33	16.09	0.36		3.00	4.46	28.20						
				36	18	46	1		8	13	79					2047	
14S/ 3W-18N 1 S	70	7.4	3018	174	51	376	13	0	203	115	843	2.5	0.4	0.34	35	2060	644
8-16-62				8.68	4.19	16.35	0.33		3.33	2.39	23.77	0.04					
				29	14	55	1		11	8	80					1710	
14S/ 3W-19H 1 S	--	7.5	1940	146	36	210	4	0	206	217	418	7.0	0.4	0.21	34	1348	513
8- 9-62				7.29	2.96	9.13	0.10		3.38	4.52	11.79	0.11					
				37	15	47	1		17	23	60	1				1174	
14S/ 3W-19N 1 S	--	7.2	9000	757	207	1175	29	0	313	792	2952	6.0	0.2	0.64	23	6706	2742
8- 8-62				37.77	17.02	51.09	0.74		5.13	16.49	83.25	0.10					
				35	16	48	1		5	16	79					6096	
14S/ 3W-19N 3 S	--	7.2	3125	290	64	320	5	0	284	478	697	0	0.8	0.31	33	2262	987
8- 8-62				14.47	5.26	13.91	0.13		4.65	9.95	19.66						
				43	16	41			14	29	57					2028	
14S/ 3W-19P 1 S	--	7.4	1875	155	51	189	3	0	261	259	358	22	0.8	0.30	28		596
7-27-61				7.73	4.19	8.22	0.08		4.28	5.39	10.10	0.35				1580	
				38	21	41			21	27	50	2				1194	
14S/ 3W-19P 2 S	--	7.6	1830	140	45	174	2	0	244	230	324	22	0.8	0.36	22		535
4-11-62				6.99	3.70	7.57	0.05		4.00	4.79	9.14	0.35				1064	
				38	20	41			22	26	50	2				1080	
14S/ 3W-19Q 1 S	--	7.8	1230	77	41	165	4	0	312	160	202	2.7	0.6	0.26	23	860	361
10-30-63				3.84	3.37	7.17	0.10		5.11	3.33	5.70	0.04					
				27	23	50	1		36	23	40					829	
14S/ 3W-20F 1 S	--	7.4	1550	96	44	160	1	0	221	116	340	1.0	0.6	0.21	22	874	421
8- 9-62				4.79	3.62	6.96	0.03		3.62	2.42	9.59	0.02					
				31	24	45			23	15	61					889	

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million, equivalents per million, percent reactance value: Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Chemical constituents in parts per million: Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
SOLEOAD HYDRO SUBUNIT				206AO		PENASQUITO HYDRO UNIT					20600						
14S/ 3W-20L 2 S	--	7.5	1200	84	37	145	2	0	255	182	191	0	0.6	0.21	21	850	362
10-30-63				4.19	3.04	6.30	0.05		4.18	3.79	5.39						
				31	22	46			31	28	40					788	
14S/ 3W-21O 1 S	--	8.2	1310	116	32	119	2	0	183	171	227	33	0.5	0.05	29	868	421
2-28-63				5.79	2.63	5.17	0.05		3.00	3.56	6.40	0.53					
				42	19	38			22	26	47	4				819	
14S/ 3W-22E 1 S	--	7.5	5633	369	134	750	8	0	405	1416	930	6.2	0.8	0.72	19	4100	1473
8-14-62				18.41	11.02	32.61	0.20		6.64	29.48	26.23	0.10					
				30	18	52			11	47	42					3833	
14S/ 3W-22F 1 S	--	6.9	5327	409	124	752	9	0	290	1450	1055	3.7	0.8	0.77	18	4299	1532
8-14-62				20.41	10.20	32.70	0.23		4.75	30.19	29.75	0.06					
				32	16	51			7	47	46					3965	
14S/ 3W-24J 1 S	70	7.7	2518	123	54	340	3	0	227	183	630	1.5	1.0	0.36	--		529
11-29-54				6.14	4.44	14.78	0.08		3.72	3.81	17.77	0.02				1540	
				24	17	58			15	15	70					1447	
14S/ 3W-29G 1 S	--	7.1	435	13	9	63	1	0	139	29	46	0	0.2	0.21	22	260	70
8-10-62				0.65	0.74	2.74	0.03		2.28	0.60	1.30						
				16	18	66	1		55	14	31					252	
14S/ 3W-29H 1 S	--	7.8	2220	170	50	230	3	0	312	195	479	16	0.8	0.33	25	1512	630
8-10-62				8.48	4.11	10.00	0.08		5.11	4.06	13.51	0.26					
				37	18	44			22	18	59	1				1323	
14S/ 3W-30F 1 S	70	7.4	3627	191	113	375	5	0	115	156	1040	69	0.7	0.49	56	2689	942
8-15-62				9.53	9.29	16.31	0.13		1.88	3.25	29.33	1.11					
				27	26	46			5	9	82	3				2063	
14S/ 3W-30G 1 S	70	6.8	1880	122	51	174	5	0	135	116	472	2.0	0.7	0.17	46	1369	514
8-16-62				6.09	4.19	7.57	0.13		2.21	2.42	13.31	0.03					
				34	23	42	1		12	13	74					1055	
14S/ 3W-32O 1 S	--	7.5	2890	245	76	370	--	0	410	472	583	--	--	0.40	33	2208	925
2- 8-63				12.23	6.25	16.09			6.72	9.83	16.44						
14S/ 3W-32R 1 S	--	7.9	3030	220	102	361	4	0	406	582	590	5.0	1.0	0.19	24	2198	969
2-28-63				10.98	8.39	15.70	0.10		6.65	12.12	16.64	0.08					
				31	24	45			19	34	47					2089	
14S/ 4W-25A 1 S	71	7.4	890	59	19	85	3	0	180	54	147	20	0.4	0.18	34	536	225
8- 8-62				2.94	1.56	3.70	0.08		2.95	1.12	4.15	0.32					
				36	19	45	1		35	13	49	4				510	
14S/ 4W-25A 2 S	--	7.2	2678	198	51	241	7	0	303	323	454	1	0.3	0.19	15	1727	704
7-14-59				9.88	4.19	10.48	0.18		4.97	6.72	12.80	0.02					
				40	17	42	1		20	27	52					1439	
14S/ 4W-25A 3 S	--	7.5	2475	193	46	280	6	0	312	321	510	0	0.6	0.36	23	1672	671
8- 8-62				9.63	3.78	12.17	0.15		5.11	6.68	14.38						
				37	15	47	1		20	26	55					1533	
15S/ 3W- 1Q 1 S	--	7.7	2510	303	123	153	3	0	369	817	312	1.2	0.9	0.05	30	2079	1263
2-28-63				15.12	10.12	6.65	0.08		6.05	17.01	8.80	0.02					
				47	32	21			19	53	28					1925	
15S/ 3W- 3N 1 S	62	6.2	267	9	5	29	2	0	25	23	42	0.8	0.4	0.14	19		43
4-12-62				0.45	0.41	1.26	0.05		0.41	0.48	1.18	0.01				188	
				21	19	58	2		20	23	57					143	
15S/ 3W- 3N 2 S	--	8.5	935	55	43	99	4	7	136	281	90	0	0.2	0.14	9	704	314
10-30-63				2.74	3.54	4.30	0.10	0.23	2.23	5.85	2.54						
				26	33	40	1	2	21	54	23					655	
15S/ 3W- 6H 1 S	--	8.1	1365	36	26	232	11	0	378	126	190	1.2	0.7	0.34	19	812	197
2-28-63				1.80	2.14	10.09	0.28		6.20	2.62	5.36	0.02					
				13	15	71	2		44	18	38					828	
POWAY HYDRO SUBUNIT				206B0													
14S/ 1W- 6C 2 S	--	7.3	1058	53	38	106	4	0	220	45	195	23	0.5	0.08	49	627	289
2-27-63				2.64	3.13	4.61	0.10		3.61	0.94	5.50	0.37					
				25	30	44	1		35	9	53	4				622	
14S/ 1W- 6P 1 S	--	8.5	950	37	40	119	3	9	190	127	155	0	0.2	0.22	25	598	257
11-19-63				1.85	3.29	5.17	0.08	0.30	3.11	2.64	4.37						
				18	32	50	1	3	30	25	42					609	
14S/ 1W-18K 1 S	--	6.9	1355	51	50	156	2	0	159	58	308	61	0.5	0.07	50	771	333
8-18-60				2.54	4.11	6.78	0.05		2.61	1.21	8.69	0.98					
				19	30	50			19	9	64	7				815	
14S/ 1W-18K 2 S	--	7.7	1270	54	29	153	2	0	192	67	230	36	0.4	0.23	40	810	254
11- 7-63				2.69	2.38	6.65	0.05		3.15	1.39	6.49	0.58					
				23	20	56			27	12	56	5				706	

State well number Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C Evap 105°C Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million, equivalents per million, percent reactance value									Chemical constituents in parts per million				
PENASQUITO HYDRO UNIT 20600																	
POWAY HYDRO SUBUNIT 20680																	
14S/ 1W-21H 1 S 5-28-64	70	7.2	1263	84 4.19 32	32 2.63 20	144 6.26 48	1 0.03	0	290 4.75 37	48 1.00 8	238 6.71 53	18 0.29 2	1.3	0.11	60	745 769	341
14S/ 2W- 1R 2 S 3-11-64	--	7.3	5118	335 16.72 31	37 3.04 6	765 33.26 62	21 0.54 1	0	142 2.33 4	846 17.61 33	1175 33.14 62	9.3 0.15	1.4	2.80	--	3382 3262	989
14S/ 2W-12K 1 S 7-24-58	--	7.0	2023	68 3.39 17	58 4.77 24	274 11.91 59	0	0	368 6.03 30	156 3.25 16	378 10.66 53	17.3 0.28 1	0.6	0	38	1311 1171	408
14S/ 2W-13L 1 S 4-24-62	--	7.4	2260	133 6.64 30	66 5.43 24	239 10.39 46	1 0.03	0	311 5.10 23	240 5.00 22	434 12.24 55	6.1 0.10	1.0	0.07	47	1436 1320	604
14S/ 2W-15R 1 S 11-19-63	--	7.4	1930	82 4.09 19	68 5.59 26	262 11.39 54	3 0.08	0	309 5.06 24	184 3.83 18	429 12.10 57	9.8 0.16 1	0.4	0.32	35	1286 1225	484
MIRAMAR HYDRO SUBUNIT 206D0																	
15S/ 2W- 2K 1 S 2-28-63	--	8.2	2010	108 5.39 24	50 4.11 19	287 12.48 57	3 0.08	0	531 8.70 39	208 4.33 20	321 9.05 41	1.2 0.02	1.1	0.12	29	1235 1269	475
15S/ 2W- 5L 1 S 2-27-63	--	7.9	2780	122 6.09 20	78 6.41 21	402 17.48 58	4 0.10	0	403 6.61 22	229 4.77 16	665 18.75 62	1.2 0.02	1.4	0.15	26	1790 1727	626
15S/ 2W-19D 1 S 3-28-63	78	7.8	2400	85 4.24 17	51 4.19 16	395 17.17 67	3 0.08	0	458 7.51 30	261 5.43 22	436 12.30 49	0	1.0	2.50	23	1582 1483	422
15S/ 3W- 1M 1 S 8-30-62	69	7.5	1545	110 5.49 34	48 3.95 24	155 6.74 41	4 0.10 1	0	303 4.97 29	373 7.77 45	154 4.34 25	0	0.6	0.45	25	1166 1019	472
15S/ 3W- 9K 1 S 8-30-62	--	7.6	1220	109 5.44 43	43 3.54 28	85 3.70 29	4 0.10 1	0	306 5.02 39	148 3.08 24	168 4.74 37	0	1.0	0.18	22	918 731	449
15S/ 3W-23P 2 S 9-18-57	75	7.9	1883	126 6.29 29	52 4.28 20	254 11.04 51	6 0.15 1	0	382 6.26 29	295 6.14 28	336 9.48 43	0.0	1.5	0.24	30	1378 1289	529
15S/ 3W-24N 1 S 9-18-57	--	6.7	619	22 1.10 17	20 1.64 26	80 3.48 55	6 0.15 2	0	51 0.84 13	105 2.19 34	121 3.41 53	0.0	0.3	0.22	40	484 420	137
15S/ 3W-26C 1 S 9-18-57	--	7.7	1681	81 4.04 21	47 3.87 20	253 11.00 58	4 0.10 1	0	362 5.93 31	211 4.39 23	307 8.66 46	0.0	1.2	0.24	30	1116 1112	396
15S/ 3W-26Q 1 S 9-18-57	--	8.2	1170	43 2.15 16	21 1.73 13	220 9.57 70	7 0.18 1	24 0.80 6	305 5.00 37	105 2.19 16	191 5.39 40	0.0	0.6	0.38	20	780 782	194
15S/ 3W-30E 1 S 4-12-62	--	7.0	3250	224 11.18 30	145 11.92 32	317 13.78 37	2 0.05	0	383 6.28 17	897 18.68 50	435 12.27 33	14 0.23 1	0.6	1.80	17	2446 2242	1156
15S/ 3W-36Q 1 S 2-23-60	--	7.1	1975	82 4.09 21	47 3.87 20	260 11.30 58	12 0.31 2	0	384 6.29 32	185 3.85 20	337 9.50 48	0	0.6	0.20	20	1345 1133	398
16S/ 3W- 5E 1 S 4-12-62	--	7.6	1900	56 2.79 15	43 3.54 19	290 12.61 66	6 0.15 1	0	419 6.87 36	183 3.81 20	307 8.66 45	0	0.6	0.49	15	1106 1107	317
16S/ 3W- 5E 3 S 2-27-63	--	7.2	3220	186 9.28 25	92 7.57 21	453 19.70 54	5 0.13	0	458 7.51 20	588 12.24 33	610 17.20 46	21 0.34 1	0.9	0.38	21	2313 2202	843
TECOLOTE HYDRO SUBUNIT 206E0																	
15S/ 3W-35G 1 S 2-23-60	--	7.6	1252	44 2.20 18	12 0.99 8	208 9.04 73	9 0.23 2	0	326 5.34 42	127 2.64 21	169 4.77 37	0	0.6	0.50	18	885 748	160
15S/ 3W-35G 3 S 2-23-60	--	7.5	1764	73 3.64 21	33 2.71 15	251 10.91 62	10 0.26 1	0	362 5.93 33	164 3.41 19	306 8.63 48	0	0.4	0.70	19	1217 1035	318
16S/ 3W-16R 1 S 10-19-55	78	8.0	1890	47 2.35 13	40 3.29 18	289 12.57 68	9 0.23 1	0	337 5.52 30	154 3.21 17	348 9.81 53	1.5 0.02	0.7	0.39	21	1076	282

State well number Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				

SAN DIEGO HYDRO UNIT 20700

LOWER SAN DIEGO HYDRO SUBUNIT 207A.

14S/ 1E-33L 1 S 5-27-64	65	7.2	684	30 1.50 21	16 1.32 19	96 4.17 59	2 0.05 1	0	224 3.67 54	10 0.21 3	103 2.90 43	0	0.6	0.04	40	360 408	141
15S/ 1E- 2G51 S 4- 7-59	68	7.0	580	38 1.90 34	24 1.97 35	39 1.70 30	2 0.05 1	0	209 3.43 61	18 0.37 7	63 1.78 32	1 0.02	0.2	0	58	401 346	194
15S/ 1E- 2K 1 S 4- 7-59	68	7.1	563	45 2.25 39	21 1.73 30	40 1.74 30	2 0.05 1	0	214 3.51 61	19 0.40 7	64 1.80 31	1 0.02	0	0.18	55	401 352	199
15S/ 1E- 2P 1 S 2-19-59	68	7.1	377	27 1.35 31	14 1.15 26	42 1.83 42	2 0.05 1	0	137 2.25 37	87 1.81 30	64 1.80 30	10 0.16 3	0.3	0.05	39	279 353	125
15S/ 1E- 6N 1 S 6- 4-63	--	7.3	1620	222 11.08 54	57 4.69 23	105 4.57 22	--	0	117 1.92 9	740 15.41 74	124 3.50 17	0	--	0	41	1552 1347	789
15S/ 1E- 7K 1 S 2-20-59	72	7.0	1220	49 2.45 21	49 4.03 35	112 4.87 43	4 0.10 1	0	171 2.80 24	54 1.12 10	220 6.20 54	86 1.39 12	0.3	0.06	46	796 704	324
15S/ 1E- 7L 1 S 8-26-54	--	7.5	725	23 1.15 15	22 1.81 24	105 4.57 60	3 0.08 1	0	166 2.72 36	33 0.69 9	135 3.81 50	26.3 0.42 5	0.7	0.12	--	 470 430	148
15S/ 1E- 7L 2 S 2-25-60	69	7.1	1098	32 1.60 16	36 2.96 29	125 5.44 54	4 0.10 1	0	201 3.29 32	31 0.65 6	222 6.26 61	0	0.5	0.24	53	710 603	228
15S/ 1E- 8G 1 S 2-19-59	68	7.2	1480	132 6.59 39	57 4.69 28	121 5.26 32	6 0.15 1	0	232 3.80 24	83 1.73 11	227 6.40 40	263 4.24 26	0.3	0.02	55	1044 1058	564
15S/ 1E- 9J 1 S 1-28-59	56	7.2	550	36 1.80 26	34 2.80 40	50 2.17 31	6 0.15 2	0	149 2.44 35	105 2.19 32	76 2.14 31	7.4 0.12 2	0.1	0.04	21	365 409	230
15S/ 1E- 9P 1 S 9-28-49	--	7.3	--	49 2.45 41	18 1.48 25	46 2.00 34	--	0	199 3.26 55	56 1.17 20	54 1.52 26	0	--	--	31	360 352	197
15S/ 1E- 9Q 2 S 9-28-49	--	7.3	--	44 2.20 39	17 1.40 25	46 2.00 36	--	0	205 3.36 60	29 0.60 11	59 1.66 30	0	--	--	37	340 333	180
15S/ 1E- 9R 1 S 10-10-49	--	7.1	--	35 1.75 34	15 1.23 24	51 2.22 43	--	0	187 3.06 59	30 0.62 12	54 1.52 29	0	--	--	25	310 302	149
15S/ 1E- 9R 2 S 1-28-59	60	8.0	557	40 2.00 36	19 1.56 28	43 1.87 34	2 0.05 1	0	180 2.95 56	25 0.52 10	64 1.80 34	1.8 0.03 1	0.2	0.05	36	334 320	178
15S/ 1E-10A 1 S 7-23-58	--	8.1	731	58 2.89 38	27 2.22 29	54 2.35 31	3 0.08 1	0	255 4.18 55	35 0.73 10	83 2.34 31	18.3 0.30 4	0	0.12	34	453 438	256
15S/ 1E-10H 1 S 11- 7-63	66	7.7	760	62 3.09 39	26 2.14 27	60 2.61 33	3 0.08 1	0	255 4.18 52	60 1.25 15	94 2.65 33	0	0.2	0.08	25	482 456	262
15S/ 1E-10N 1 S 10-10-49	--	7.3	--	40 2.00 36	15 1.23 22	53 2.30 42	--	0	193 3.16 57	34 0.71 13	59 1.66 30	0	--	--	19	315 315	162
15S/ 1E-12R51 S 12-29-52	--	6.8	322	15 0.75 23	17 1.40 43	24 1.04 32	1 0.03 1	0	132 2.16 65	12 0.25 8	28 0.79 24	6.0 0.10 3	0.2	0.02	--	 228 166	108
15S/ 1E-16B 1 S 9-23-49	--	7.3	--	72 3.59 56	20 1.64 26	26 1.13 18	--	0	211 3.46 54	53 1.10 17	64 1.80 28	0	--	--	37	385 376	26[illegible]
15S/ 1E-16C 2 S 9-27-49	--	7.3	--	49 2.45 40	19 1.56 25	50 2.17 35	--	0	224 3.67 59	38 0.79 13	62 1.75 28	0	--	--	37	370 365	201
15S/ 1E-16C 3 S 10-11-49	--	6.9	--	41 2.05 34	19 1.56 26	55 2.39 40	--	0	187 3.06 51	63 1.31 22	59 1.66 28	0	--	--	19	360 348	181
15S/ 1E-16C 4 S 9-28-49	--	7.3	--	61 3.04 49	20 1.64 26	36 1.57 25	--	0	199 3.26 52	71 1.48 24	54 1.52 24	0	--	--	31	380 371	234
15S/ 1E-16E 1 S 9-27-49	--	7.3	--	60 2.99 49	19 1.56 25	36 1.57 26	--	0	218 3.57 58	44 0.92 15	59 1.66 27	0	--	--	37	370 362	228

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C Evap 105°C Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
SAN DIEGO HYDRO UNIT 20700																	
LOWER SAN DIEGO HYDRO SUBUNIT 207A0																	
15S/ 1E-17B 2 S	66	7.4	805	62	29	69	3	0	254	73	98	0	0.4	0.02	30	480	274
1-28-59				3.09	2.38	3.00	0.08		4.16	1.52	2.76						
				36	28	35	1		49	18	33					489	
15S/ 1E-17D 2 S	77	7.4	698	53	26	48	1	0	212	64	73	0	0.2	0.08	26	485	239
6- 3-60				2.64	2.14	2.09	0.03		3.47	1.33	2.06						
				38	31	30			51	19	30					395	
15S/ 1E-17H 1 S	--	7.1	--	51	19	43	--	0	193	43	69	0	--	--	31	360	205
9-27-49				2.54	1.56	1.87			3.16	0.90	1.95						
				43	26	31			53	15	32					351	
15S/ 1E-17H 2 S	--	6.9	--	47	20	56	--	--	211	51	67	--	--	--	19	365	200
1-27-47				2.35	1.64	2.43			3.46	1.06	1.89						
15S/ 1E-17H 3 S	--	7.0	--	37	19	62	--	--	198	46	67	--	--	--	31	365	171
1-27-47				1.85	1.56	2.70			3.25	0.96	1.89						
15S/ 1E-17H 4 S	--	6.8	--	34	15	59	--	--	178	39	62	--	--	--	19	320	147
1-27-47				1.70	1.23	2.57			2.92	0.81	1.75						
15S/ 1E-17H 7 S	68	7.3	670	48	22	53	3	0	165	88	78	3.1	0.6	0.05	40	391	211
2-25-60				2.40	1.81	2.30	0.08		2.70	1.83	2.20	0.05					
				36	27	35	1		40	27	32	1				417	
15S/ 1E-18J 1 S	--	7.1	905	50	27	81	4	0	130	35	182	13	0.2	0	46	581	236
4- 7-59				2.50	2.22	3.52	0.10		2.13	0.73	5.13	0.21					
				30	27	42	1		26	9	63	3				502	
15S/ 1E-18J 2 S	--	7.6	736	36	21	72	4	0	131	23	134	73	0.2	0	31	505	177
6- 2-60				1.80	1.73	3.13	0.10		2.15	0.48	3.78	1.18					
				27	26	46	1		28	6	50	16				459	
15S/ 1E-18L 1 S	68	7.0	812	67	30	61	3	0	218	133	80	0	0.2	0	30	574	291
4- 8-59				3.34	2.47	2.65	0.08		3.57	2.77	2.26						
				39	29	31	1		42	32	26					511	
15S/ 1E-19F 1 S	69	7.6	1233	58	34	157	2	0	322	71	189	23	0.6	0	41	861	285
4- 8-59				2.89	2.80	6.83	0.05		5.28	1.48	5.33	0.37					
				23	22	54			42	12	43	3				734	
15S/ 1E-19H 1 S	--	7.4	607	40	19	55	1	0	122	79	53	55	0.1	0.07	45	429	178
2-20-59				2.00	1.56	2.39	0.03		2.00	1.64	1.49	0.89					
				33	26	40	1		33	27	25	15				407	
15S/ 1E-23D 1 S	--	8.1	947	72	17	98	2	0	177	53	181	2.5	0.6	0.04	39	530	250
2-25-60				3.59	1.40	4.26	0.05		2.90	1.10	5.10	0.04					
				39	15	46	1		32	12	56					552	
15S/ 1E-29F 1 S	73	7.4	2313	130	83	226	5	0	389	171	457	11.1	0.4	0.40	40	1571	667
6-16-58				6.49	6.83	9.83	0.13		6.38	3.56	12.89	0.18					
				28	29	42	1		28	15	56	1				1315	
15S/ 1E-29M 1 S	71	7.4	1055	60	35	133	1	0	220	79	184	73	0.6	0.09	49	738	294
2-19-59				2.99	2.88	5.78	0.03		3.61	1.64	5.19	1.18					
				26	25	49			31	14	45	10				723	
15S/ 1E-30HS1 S	--	--	--	46	26	94	3	5	132	67	163	4.0	0.7	--	--		222
2- 8-60				2.30	2.14	4.09	0.08	0.17	2.16	1.39	4.60	0.06				609	
				27	25	48	1	2	26	17	55	1				474	
15S/ 1E-31R 1 S	--	7.1	1310	71	39	162	3	0	178	172	216	65	0.4	0.17	37	900	338
11- 6-63				3.54	3.21	7.04	0.08		2.92	3.58	6.09	1.05					
				26	23	51	1		21	26	45	8				853	
16S/ 1E- 5M 1 S	--	8.5	1330	86	40	132	6	12	234	95	245	0	0.4	0.16	48	780	379
6-26-51				4.29	3.29	5.74	0.15	0.40	3.84	1.98	6.91						
				32	24	43	1	3	29	15	53					780	
16S/ 1E- 5N 2 S	--	7.4	1767	--	--	--	--	0	328	--	245	179	--	--	--		532
6-25-51									5.38		6.91	2.89					
16S/ 1E- 5P 1 S	--	8.0	1476	89	46	147	--	0	227	199	205	113	--	0	--		411
6-21-51				4.44	3.78	6.39			3.72	4.14	5.78	1.82				920	
				30	26	44			24	27	37	12				911	
16S/ 1E- 5P 2 S	--	8.2	1610	107	42	166	4	0	244	150	302	6.4	0.4	0.20	41	939	440
6-25-51				5.34	3.45	7.22	0.10		4.00	3.12	8.52	0.10					
				33	21	45	1		25	20	54	1				939	
16S/ 1E- 6C 1 S	--	7.7	1470	71	43	170	3	0	222	110	214	140	0.5	0.09	43	904	354
4-23-51				3.54	3.54	7.39	0.08		3.64	2.29	6.03	2.26					
				24	24	51	1		26	16	42	16				904	
16S/ 1E- 6D 1 S	--	7.6	1240	68	39	119	4	0	205	131	133	133	--	0.16	56	784	330
4-17-51				3.39	3.21	5.17	0.10		3.36	2.73	3.75	2.15					
				29	27	44	1		28	23	31	18				784	

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million, equivalents per million, percent reactance value									Chemical constituents in parts per million				
SAN DIEGO HYDRO UNIT 20700																	
LOWER SAN DIEGO HYDRO SUBUNIT 207A0																	
16S/ 1E- 6E 3 S	--	8.1	1600	6	13	295	1	0	241	133	221	107	--	0.17	34	929	69
4-17-51				0.30	1.07	12.83	0.03		3.95	2.77	6.23	1.73					
				2	8	90			27	19	42	12				929	
16S/ 1E- 6F 1 S	--	7.4	1480	88	49	130	3	0	205	136	226	98	--	0.11	46	879	421
4-19-51				4.39	4.03	5.65	0.08		3.36	2.83	6.37	1.58					
				31	28	40	1		24	20	45	11				879	
16S/ 1E- 6F 3 S	77	7.5	1390	74	46	135	3	0	182	103	193	136	--	0.20	47	827	374
4-19-51				3.69	3.78	5.87	0.08		2.98	2.14	5.44	2.19					
				27	28	44	1		23	17	43	17				827	
16S/ 1E- 6G 1 S	--	7.6	1480	72	44	172	3	0	223	109	211	197	--	0.16	48	966	361
4-18-51				3.59	3.62	7.48	0.08		3.65	2.27	5.95	3.18					
				24	25	51	1		24	15	40	21				966	
16S/ 1E- 6G 3 S	--	8.5	1560	92	49	175	4	10	172	205	185	222	0.4	0.36	52	1080	431
6-26-51				4.59	4.03	7.61	0.10	0.33	2.82	4.27	5.22	3.58					
				28	25	47	1	2	17	26	32	22				1079	
16S/ 1E- 6L 1 S	--	7.4	1862	126	71	166	--	0	246	177	313	150	--	0.13	--		607
3-27-51				6.29	5.84	7.22			4.03	3.69	8.83	2.42				1344	
				33	30	37			21	19	47	13				1124	
16S/ 1E- 6L 2 S	--	7.3	2440	173	96	170	4	0	218	264	408	204	--	0.08	46	1470	827
4-19-51				8.63	7.90	7.39	0.10		3.57	5.50	11.51	3.29					
				36	33	31			15	23	48	14				1474	
16S/ 1E- 6M 1 S	--	7.6	1530	85	85	106	1	0	278	154	212	86	--	0.08	64	930	562
4- 9-51				4.24	6.99	4.61	0.03		4.56	3.21	5.98	1.39					
				27	44	29			30	21	39	9				930	
16S/ 1E- 6N 1 S	--	8.2	1934	--	--	--	--	0	244	--	375	142	--	--	--		600
6-27-51									4.00		10.58	2.29					
16S/ 1E- 6O 1 S	--	7.6	1464	--	--	--	--	0	261	--	262	42	--	--	--		676
6-27-51									4.28		7.39	0.68					
16S/ 1E- 6O 3 S	--	8.2	1185	--	--	--	--	0	239	--	244	116	--	--	--		436
6-27-51									3.92		6.88	1.87					
16S/ 1E- 6R 1 S	--	8.2	1266	--	--	--	--	0	275	--	190	56	--	--	--		332
6-27-51									4.51		5.36	0.90					
16S/ 1E- 7A 1 S	--	7.8	1536	91	55	140	--	0	244	145	285	43	--	0.40	--		453
6-20-51				4.54	4.52	6.09			4.00	3.02	8.04	0.69				989	
				30	30	40			25	19	51	4				879	
16S/ 1E- 7C 1 S	--	7.4	1529	--	--	--	--	0	229	--	315	67	--	--	--		444
5-17-51									3.75		8.88	1.08					
16S/ 1E- 7C 3 S	--	7.7	1970	129	75	178	3	0	296	123	402	72	0.2	0.53	59	1190	631
5-17-51				6.44	6.17	7.74	0.08		4.85	2.56	11.34	1.16					
				32	30	38			24	13	57	6				1187	
16S/ 1E- 7C 4 S	--	7.5	2049	--	--	--	--	0	349	--	400	101	--	--	--		624
6-20-51									5.72		11.28	1.63					
16S/ 1E- 7C 6 S	--	8.2	1454	--	--	--	--	0	275	--	254	44	--	--	--		392
6-20-51									4.51		7.16	0.71					
16S/ 1E- 7D 1 S	--	7.5	2090	138	87	178	3	0	339	142	415	59	0.1	0.77	56	1240	703
5-15-51				6.89	7.15	7.74	0.08		5.56	2.96	11.70	0.95					
				32	33	35			26	14	55	4				1245	
16S/ 1E- 7E 1 S	--	--	3436	--	--	--	--	0	217	--	940	120	--	--	--		
5-16-51									3.56		26.51	1.94					
16S/ 1E- 7E 3 S	--	8.2	1600	--	--	--	--	0	266	--	350	48	--	--	--		436
5-15-51									4.36		9.87	0.77					
16S/ 1E- 7E 5 S	--	--	1155	--	--	--	--	0	220	--	225	34	--	--	--		
5-15-51									3.61		6.35	0.55					
16S/ 1E- 7M 1 S	--	7.1	3268	224	160	214	--	0	230	188	799	234	--	0.06	--		1218
5-16-51				11.18	13.16	9.30			3.77	3.91	22.53	3.77				3268	
				33	39	28			11	12	66	11				1932	
16S/ 1E- 7M 2 S	--	7.3	2865	172	124	213	--	0	186	126	753	86.8	--	0.03	--		940
5-16-51				8.58	10.20	9.26			3.05	2.62	21.23	1.40				2552	
				31	36	33			11	9	75	5				1566	

State well number Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C Evap 105°C Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million, equivalents per million, percent reactance value									Chemical constituents in parts per million				
LOWER SAN DIEGO HYDRO SUBUNIT Z07A0						SAN DIEGO HYDRO UNIT					Z0700						
16S/ 1E- 7M 3 S 5-16-51	--	--	3496	--	--	--	--	0	215 3.52	--	930 26.23	130 2.10	--	--	--		
16S/ 1E- 7M 4 S 5-16-51	--	--	3257	--	--	--	--	0	249 4.08	--	725 20.45	249 4.02	--	--	--		
16S/ 1E- 7M 5 S 5-15-51	--	--	2433	--	--	--	--	0	207 3.39	--	600 16.92	84 1.35	--	--	--		
16S/ 1E- 7M 6 S 5-15-51	--	--	2262	--	--	--	--	0	195 3.20	--	510 14.38	131 2.11	--	--	--		
16S/ 1E- 7N 1 S 5-16-51	--	7.7	1146	58 2.89 26	48 3.95 36	96 4.17 38	--	0	237 3.88 35	78 1.62 15	157 4.43 40	76 1.23 11	--	0	--	665 630	342
16S/ 1E- 7P 1 S 5-16-51	--	7.8	1750	107 5.34 30	76 6.25 35	143 6.22 35	4 0.10 1	0	246 4.03 23	132 2.75 15	295 8.32 47	170 2.74 15	0.2	0.33	52	1100 1100	580
16S/ 1E- 8B 2 S 6-25-51	--	8.1	1450	97 4.84 32	51 4.19 28	138 6.00 40	4 0.10 1	0	242 3.97 27	188 3.91 26	248 6.99 47	1.8 0.03	0.3	0.33	42	890 889	452
16S/ 1E- 8D 2 S 6-21-51	--	8.1	1480	100 4.99 31	53 4.36 27	152 6.61 41	3 0.08	0	284 4.65 30	184 3.83 24	200 5.64 36	95 1.53 10	0.2	0.61	59	986 986	468
16S/ 1E- 8D 5 S 6-20-51	--	7.3	1419	84 4.19 30	48 3.95 28	135 5.87 42	--	0	268 4.39 31	143 2.98 21	195 5.50 39	84 1.35 9	--	0	--	881 821	407
16S/ 1E- 8M 1 S 7-11-51	--	8.6	1949	42 2.10 22	38 3.13 32	100 4.35 45	3 0.08 1	10 0.33 4	159 2.61 28	109 2.27 24	115 3.24 35	52 0.84 9	0.9	0.11	58	606 606	262
15S/ 1W- 1A 1 S 2-18-59	--	7.6	805	18 0.90 10	32 2.63 28	129 5.61 60	9 0.23 2	0	165 2.70 31	30 0.62 7	190 5.36 61	7.4 0.12 1	1.5	0.06	68	532 566	177
15S/ 1W- 1J 2 S 3-13-59	65	7.1	751	32 1.60 23	19 1.56 23	83 3.61 53	2 0.05 1	0	180 2.95 41	35 0.73 10	119 3.36 47	5 0.06 1	0.2	0.40	19	501 403	158
15S/ 1W- 1J 7 S 7- 9-56	--	7.2	826	36 1.80 22	25 2.06 25	103 4.48 54	--	0	146 2.39 29	60 1.25 15	159 4.48 54	15 0.24 3	0.5	--	28	572 498	193
15S/ 1W- 1R 1 S 6-21-60	--	7.5	900	50 2.50 30	18 1.48 18	96 4.26 51	3 0.08 1	0	171 2.80 33	48 1.00 12	163 4.60 54	2.8 0.05 1	1.0	0.05	43	520 511	199
15S/ 1W- 1R 2 S 2-19-59	--	8.0	891	40 2.00 23	26 2.14 25	100 4.35 51	1 0.03	0	161 2.64 31	53 1.10 13	164 4.62 55	5.5 0.09 1	0.3	0.06	30	530 499	207
15S/ 1W-11G 1 S 2-17-59	--	7.8	916	53 2.64 26	41 3.37 33	97 4.22 41	4 0.10 1	0	189 3.10 30	68 1.42 14	156 4.40 43	86 1.39 13	0.3	0.12	46	635 644	301
15S/ 1W-13E 1 S 2-18-59	--	6.9	1585	108 5.39 32	60 4.93 29	145 6.30 38	6 0.15 1	0	296 4.85 30	123 2.56 16	262 7.39 46	82 1.32 8	0.4	0.07	51	1031 983	516
15S/ 1W-13J 1 S 10- 7-59	--	7.5	--	117 5.84 38	59 4.85 32	104 4.52 30	4 0.10 1	0	201 3.29 22	160 3.33 23	285 8.04 55	0	0.2	--	--	1110 828	535
15S/ 1W-13J 2 S 10- 7-59	--	7.3	--	108 5.39 35	53 4.36 28	130 5.65 36	4 0.10 1	0	222 3.64 24	217 4.52 30	243 6.85 46	0.0	0.2	--	--	1040 864	488
15S/ 1W-13J 3 S 10- 7-59	--	7.5	--	93 4.64 31	47 3.87 26	144 6.26 42	4 0.10 1	0	212 3.47 24	257 5.35 37	194 5.47 38	0.2	0.2	--	--	975 844	426
15S/ 1W-13N 3 S 11- 7-63	--	7.4	1350	87 4.34 30	46 3.78 26	142 6.17 43	2 0.05	0	206 3.38 24	158 3.29 23	248 6.99 49	35 0.56 4	0.2	0.18	27	876 847	406
15S/ 1W-13Q 1 S 2-25-60	--	8.0	1060	76 3.79 36	36 2.96 28	86 3.74 35	3 0.08 1	0	192 3.15 30	81 1.69 16	197 5.56 53	2.5 0.04	0.6	0.03	40	606 617	338
15S/ 1W-14Q 1 S 9-17-58	87	7.2	2049	114 5.69 27	70 5.76 28	215 9.35 45	2 0.05	--	173 2.84 14	58 1.21 6	515 14.52 70	131 2.11 10	0.6	0.14	30	1450 1221	573

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				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
SAN DIEGO HYDRO UNIT 20700																	
LOWER SAN DIEGO HYDRO SUBUNIT 207A0																	
15S/ 1W-15G 1 S 2-25-60	--	7.7	1030	48 2.40 23	36 2.96 29	111 4.83 47	2 0.05	0	262 4.29 42	39 0.81 8	170 4.79 47	25 0.40 4	0.7	--	--	614 561	268
15S/ 1W-17B 1 S 1-17-64	--	6.9	963	43 2.15 24	31 2.55 29	94 4.09 46	2 0.05 1	0	68 1.11 12	119 2.48 28	188 5.30 59	5 0.08 1	0.6	0.02	27	630 543	235
15S/ 1W-22D 1 S 2-25-60	69	5.9	2225	52 2.59 12	34 2.80 13	356 15.48 74	2 0.05	0	27 0.44 2	103 2.14 11	624 17.60 87	3.1 0.05	0.9	0.09	14	1254 1202	270
15S/ 1W-22G 1 S 6- 2-60	--	7.2	1251	52 2.59 23	34 2.80 25	130 5.65 51	2 0.05	0	222 3.64 33	33 0.69 6	222 6.26 56	31 0.50 5	0.6	0.34	36	800 650	270
15S/ 1W-22P 1 S 2-25-60	68	4.7	3800	387 19.31 39	190 15.63 32	322 14.00 28	8 0.20	0	6 0.10	1727 35.96 75	429 12.10 25	2.5 0.04	1.0	0.03	43	3247 3112	1748
15S/ 1W-22Q 1 S 2-24-60	--	7.3	2169	199 9.93 43	89 7.32 31	135 5.87 25	5 0.13 1	0	179 2.93 12	672 13.99 58	246 6.99 29	1 0.02	0.3	0	40	1523 1477	863
15S/ 1W-22Q 2 S 6-25-58	--	7.0	2646	243 12.13 41	118 9.70 33	175 7.61 26	5 0.13	0	234 3.84 13	700 14.57 50	390 11.00 37	0	0.4	0.30	29	1785 1776	1092
15S/ 1W-23H 4 S 6- 2-60	--	6.3	1750	181 9.03 45	89 7.32 37	82 3.57 18	5 0.13 1	0	99 1.62 8	764 15.91 79	92 2.59 13	0	0.2	0.10	21	1270 1283	818
15S/ 1W-23H 5 S 4- 8-59	--	7.3	2291	275 13.72 46	134 11.02 37	110 4.78 16	6 0.15 1	0	37 0.61 2	1278 26.61 90	78 2.20 7	0.0	0.6	0.09	30	2094 1930	1238
15S/ 1W-23P 1 S 6- 2-60	--	6.9	1924	185 9.23 42	92 7.57 35	113 4.91 23	4 0.10	0	133 2.18 10	717 14.93 69	156 4.40 20	0	0.1	0.08	20	1375 1352	841
15S/ 1W-24C 4 S 6- 2-60	--	7.1	1870	144 7.19 37	74 6.09 32	136 5.91 31	4 0.10 1	0	216 3.54 18	366 7.62 39	300 8.46 43	1 0.02	0.3	0.18	24	1275 1156	665
15S/ 1W-24C 5 S 1-31-62	70	7.9	1811	142 7.09 38	64 5.26 28	146 6.35 34	5 0.13 1	0	242 3.97 21	312 6.50 34	302 8.52 45	3 0.05	0.5	0.32	32	1240 1126	618
15S/ 1W-24C 6 S 10- 7-59	--	8.3	--	131 6.54 39	59 4.85 29	124 5.39 32	3 0.08	0	207 3.39 21	248 5.16 32	276 7.76 48	0.3	0.3	--	--	 1210 943	570
15S/ 1W-24C 7 S 10- 7-59	--	7.6	--	167 8.33 41	79 6.50 32	124 5.39 26	5 0.13 1	0	177 2.90 14	366 7.62 38	341 9.62 48	0	0.2	--	--	 1545 1169	742
15S/ 1W-24C 9 S 11- 7-63	68	7.8	1730	176 8.78 46	34 2.80 15	167 7.26 38	4 0.10 1	0	262 4.29 23	272 5.66 30	311 8.77 47	5.1 0.08	0.2	0.18	28	1286 1126	579
15S/ 1W-24C11 S 1-22-48	--	6.5	--	59 2.94	25 2.06	89 3.87	--	--	220 3.61	84 1.75	124 3.50	--	--	0	25	520	250
15S/ 1W-24D 1 S 1-22-48	--	7.1	--	82 4.09	46 3.78	186 8.09	--	--	321 5.26	133 2.77	282 7.95	--	--	0	37	930	394
15S/ 1W-24D 2 S 8- 9-27	--	--	--	65 3.24 32	30 2.47 24	102 4.43 44	--	0	292 4.79 47	89 1.85 18	125 3.53 35	0	--	--	15	647 570	286
15S/ 1W-24D 3 S 8-11-27	--	--	--	77 3.84 33	34 2.80 24	118 5.13 44	--	0	281 4.61 39	114 2.37 20	170 4.79 41	0	--	--	20	744 671	332
15S/ 1W-24D 5 S 2-25-60	69	--	2380	186 9.28 36	91 7.48 29	197 8.57 34	5 0.13 1	0	244 4.00 16	511 10.64 42	383 10.80 42	[illegible] 0.04	0.8	0.04	[illegible]	1559 1525	839
15S/ 1W-24D 7 S 1-22-48	--	6.9	--	71 3.54	34 2.80	136 5.91	--	--	283 4.64	139 2.89	168 4.74	--	--	0	37	730	317
15S/ 1W-24D 9 S 10- 7-59	--	7.4	--	142 7.09 38	67 5.51 29	136 6.00 32	5 0.13 1	0	107 1.75 9	425 8.85 47	293 8.26 44	0.1	0.3	--	--	 1360 1123	631
15S/ 1W-24J 1 S 6- 2-60	74	7.1	2113	140 6.99 34	85 6.99 34	151 6.57 32	4 0.10	0	196 3.21 16	210 4.37 21	446 12.58 61	21 0.34 2	0.3	0.10	27	1360 1181	700

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C Evap 105°C Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
LOWER SAN DIEGO HYDRO SUBUNIT Z07A0				SAN DIEGO HYDRO UNIT							Z0700						
15S/ 1W-25F 1 S	--	7.4	2775	167	133	213	2	0	256	428	479	184	0.3	0.06	56	1924	964
2-18-59				8.33	10.94	9.26	0.05		4.20	8.91	13.51	2.97					
				29	38	32			14	30	46	10				1788	
15S/ 1W-25J 1 S	--	7.9	950	52	23	90	11	0	98	70	186	34	0.8	0.05	41	597	224
2-18-59				2.59	1.89	3.91	0.28		1.61	1.46	5.25	0.55					
				30	22	45	3		18	16	59	6				556	
15S/ 1W-27B 2 S	--	7.2	1851	152	77	180	5	0	261	441	280	6.0	0.6	0.08	--		696
7- 8-53				7.58	6.33	7.83	0.13		4.28	9.18	7.90	0.10				1401	
				35	29	36	1		20	43	37					1270	
15S/ 1W-27G 1 S	--	7.6	1788	106	60	188	3	0	355	179	305	15	0.2	0	49	1122	511
7-22-58				5.29	4.93	8.17	0.08		5.82	3.73	8.60	0.24					
				29	27	44			32	20	47	1				1080	
15S/ 1W-27G 5 S	84	7.4	596	49	18	50	4	--	129	120	53	2.5	0.3	0.06	10	380	197
9-17-58				2.45	1.48	2.17	0.10		2.11	2.50	1.49	0.04					
				40	24	35	2		34	41	24	1				370	
15S/ 1W-27G 6 S	--	7.8	985	78	26	83	6	0	148	237	80	2	0.3	0.08	11	675	302
6- 2-60				3.89	2.14	3.61	0.15		2.43	4.93	2.26	0.03					
				40	22	37	2		25	51	23					596	
15S/ 1W-27G 7 S	--	7.9	864	40	28	88	2	0	173	47	130	44	0.5	0.12	64	515	215
4-19-62				2.00	2.30	3.83	0.05		2.84	0.98	3.67	0.71					
				24	28	47	1		35	12	45	9				529	
15S/ 1W-27L 1 S	--	7.2	1449	70	45	114	--	0	132	35	269	93	--	0	--		360
1-12-51				3.49	3.70	4.96			2.16	0.73	7.59	1.50				1195	
				29	30	41			18	6	63	13				691	
15S/ 1W-27N 1 S	74	7.4	1875	133	60	144	3	0	340	31	439	28	0.4	0.22	38	1245	579
6- 2-60				6.64	4.93	6.26	0.08		5.57	0.65	12.38	0.45					
				37	28	35			29	3	65	2				1044	
15S/ 1W-28G 1 S	73	7.0	2857	156	97	271	4	0	288	136	684	31	0.2	0.18	51	1870	789
6- 1-60				7.78	7.98	11.78	0.10		4.72	2.83	19.29	0.50					
				28	29	43			17	10	71	2				1572	
15S/ 1W-28K 2 S	--	7.1	2557	158	85	242	4	0	263	102	658	41	0.3	0.14	40	1670	744
6- 1-60				7.88	6.99	10.52	0.10		4.31	2.12	18.56	0.66					
				31	27	41			17	8	72	3				1460	
15S/ 1W-28L 1 S	70	7.0	3690	255	127	410	2	--	337	171	1110	26	0.6	0.14	60	2920	1159
9-17-58				12.72	10.44	17.83	0.05		5.52	3.56	31.30	0.42					
				31	25	43			14	9	77	1				2327	
15S/ 1W-28Q 2 S	72	7.1	3692	220	129	331	1	0	307	74	1060	0	0.4	0.20	29	2355	1080
6- 2-60				10.98	10.61	14.39	0.03		5.03	~~1.54~~	29.89						
				30	29	40			14	4	82					1996	
15S/ 1W-28Q 3 S	--	7.7	2550	140	63	355	3	0	409	164	602	13	0.2	0.55	35	1630	609
11- 7-63				6.99	5.18	15.44	0.08		6.70	3.41	16.98	0.21					
				25	19	56			25	12	62	1				1577	
15S/ 1W-28R 1 S	--	7.3	3250	201	134	292	4	0	372	134	881	2	0.3	0.22	30	2150	1053
6- 2-60				10.03	11.02	12.70	0.10		6.10	2.79	24.84	0.03					
				30	33	38			18	8	74					1861	
15S/ 1W-28R 2 S	--	7.1	3011	190	89	294	6	0	315	176	706	26	0.4	0.48	40	1955	841
6- 2-60				9.48	7.32	12.78	0.15		5.16	3.66	19.91	0.42					
				32	25	43	1		18	13	68	1				1683	
15S/ 1W-28R 4 S	--	7.9	2227	--	--	--	--	0	298	--	535	24	--	--	--		552
7- 5-51									4.88		15.09	0.39					
15S/ 1W-29M 1 S	69	7.1	3236	292	117	235	5	0	227	45	1000	52	0.6	0.06	30	2990	1210
10-23-58				14.57	9.62	10.22	0.13		3.72	0.94	28.20	0.84					
				42	28	30			11	3	84	2				1888	
15S/ 1W-29Q 1 S	69	7.6	479	45	11	30	9	0	144	49	31	10	0.1	0.14	22	330	158
6- 1-60				2.25	0.90	1.30	0.23		2.36	1.02	0.87	0.16					
				48	19	28	5		54	23	20	4				278	
15S/ 1W-30K 1 S	69	7.6	1116	53	40	95	7	0	154	63	224	1	0.2	0.16	17	710	297
6- 1-60				2.64	3.29	4.13	0.18		2.52	1.31	6.32	0.02					
				26	32	40	2		25	13	62					576	
15S/ 1W-30K 2 S	--	7.4	920	58	23	104	3	0	202	68	152	9.7	0.4	0.25	25	586	239
11- 7-63				2.89	1.89	4.52	0.08		3.31	1.42	4.29	0.16					
				31	20	48	1		36	15	47	2				543	
15S/ 1W-30K 3 S	--	7.5	604	23	15	60	2	0	77	11	102	27	0.1	0.04	29	335	119
6- 1-60				1.15	1.23	2.61	0.05		1.26	0.23	2.88	0.44					
				23	24	52	1		26	5	60	9				307	
15S/ 1W-30M 1 S	--	7.0	789	41	28	74	4	--	146	45	144	12	0.5	0.05	60	516	218
4- 8-59				2.05	2.30	3.22	0.10		2.39	0.94	4.06	0.19					
				27	30	42	1		32	12	54	3				480	

State well number Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C Evap 105°C Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million equivalents per million percent reactance value									Chemical constituents in parts per million				
SAN DIEGO HYDRO UNIT 20700																	
LOWER SAN DIEGO HYDRO SUBUNIT 207A0																	
15S/ 1W-33A 1 S 6- 2-60	72	7.9	4007	233 11.63 28	124 10.20 25	437 19.00 46	2 0.05	0	462 7.57 19	191 3.98 10	1028 26.99 71	3 0.05	0.3	0.46	46	2640 2294	1092
15S/ 1W-33B 1 S 12- 7-60	67	7.3	4030	235 11.73 29	115 9.46 23	448 19.48 48	1 0.03	0	372 6.10 15	211 4.39 11	1046 29.50 73	12 0.19	0.4	0.62	33	 2486 2285	1060
15S/ 1W-33C 1 S 10-23-58	--	6.9	2822	217 10.83 39	105 8.64 31	191 8.30 30	7 0.18 1	--	88 1.44 5	57 1.19 4	788 22.22 60	167 3.02 11	0.1	0	40	2428 1635	974
15S/ 1W-34D 2 S 6- 2-60	--	7.4	2617	167 8.33 33	88 7.24 29	214 9.30 37	4 0.10	0	304 4.98 21	48 1.00 4	636 17.94 74	19 0.31 1	0.4	0.12	39	1660 1365	779
15S/ 1W-34M 1 S 12- 6-60	68	7.2	3050	184 9.18 30	56 4.61 15	378 16.44 54	2 0.05	0	395 6.47 22	197 4.10 14	683 19.26 64	15 0.24 1	0.4	0.82	37	 2852 1747	690
15S/ 1W-34M 2 S 6- 4-62	69	7.9	2280	149 7.44 32	71 5.84 25	230 10.00 43	5 0.13 1	0	318 5.21 22	143 2.98 13	531 14.97 64	8.6 0.14 1	0.2	0.55	33	 1520 1328	665
15S/ 1W-34P 1 S 5- 1-51	--	7.3	3135	198 9.88 31	107 8.80 28	292 12.70 40	--	0	335 5.49 17	106 2.21 7	850 23.97 73	73.4 1.18 4	--	0.10	--	 2725 1791	935
15S/ 1W-34D 1 S 5- 1-51	--	7.6	2650	157 7.83 28	102 8.39 30	265 11.52 41	2 0.05	0	272 4.46 17	87 1.81 7	668 18.84 73	39 0.63 2	0.2	0.08	64	1520 1516	812
15S/ 1W-34R 1 S 4-25-51	--	7.8	1850	107 5.34 30	57 4.69 26	176 7.65 43	2 0.05	0	182 2.98 17	75 1.56 9	435 12.27 70	49 0.79 4	0.4	0.43	63	1050 1054	502
15S/ 1W-34R 2 S 5- 1-51	--	7.2	1831	--	--	--	--	0	200 3.28	--	465 13.11	48 0.77	--	--	--		460
15S/ 1W-34R 3 S 7-10-57	--	7.2	1880	120 5.99 30	70 5.76 28	193 8.39 41	3 0.08	0	153 2.51 12	191 3.98 19	466 13.14 64	64.4 1.04 5	0.1	0	--	1376 1183	588
15S/ 1W-34R 4 S 5- 2-51	--	7.4	2049	--	--	--	--	0	195 3.20	--	530 14.95	56 0.90	--	--	--		612
15S/ 1W-34R 5 S 5- 2-51	--	7.4	1709	--	--	--	--	0	164 2.69	--	426 12.01	58 0.94	--	--	--		508
15S/ 1W-35N 1 S 4-25-51	--	7.1	1770	107 5.34 32	68 5.59 34	130 5.65 34	--	0	127 2.08 12	39 0.81 5	445 12.55 75	75 1.21 7	--	0.03	--	 1384 926	547
15S/ 1W-35N 2 S 4-25-51	--	7.1	1324	--	--	--	--	0	169 2.77	--	290 8.18	58 0.94	--	--	--		316
15S/ 1W-36Q 1 S 4-23-51	--	7.4	1976	126 6.29 33	78 6.41 33	152 6.61 34	--	0	217 3.56 17	180 3.75 18	412 11.62 57	93 1.50 7	--	0.08	--	 1360 1148	636
15S/ 1W-36R 1 S 4- 9-51	--	7.5	1739	118 5.89 35	61 5.02 30	137 5.96 35	--	0	207 3.39 20	141 2.94 17	310 8.74 51	119 1.92 11	--	0	--	 1192 988	546
15S/ 2W-25H 1 S 7- 7-53	--	7.7	1869	79 3.94 19	70 5.76 28	250 10.87 53	5 0.13 1	0	137 2.25 11	138 2.87 14	540 15.23 75	2.5 0.04	0.7	0.10	--	 1335 1153	485
15S/ 2W-25J 1 S 6- 1-60	--	7.1	906	32 1.60 19	27 2.22 26	107 4.65 54	4 0.10 1	0	188 3.08 35	44 0.92 10	142 4.00 45	51 0.82 9	0.3	0	28	615 528	191
15S/ 2W-30K 1 S 2-24-60	66	6.7	790	41 2.05 5	23 1.89 4	920 40.00 91	4 0.10	0	104 1.70 22	102 2.12 27	106 2.99 38	60 0.97 12	0.6	0.25	32	484 1340	197
15S/ 2W-35RS1 S 2-24-60	--	7.1	1940	102 5.09 37	2 0.16 1	195 8.48 62	1 0.03	0	299 4.90 26	122 2.54 13	408 11.51 61	3.7 0.06	0.8	0.08	73	1096 1055	263
15S/ 3W-36L 1 S 2-23-60	--	7.8	1940	85 4.24 22	40 3.29 17	274 11.91 60	10 0.26 1	0	403 6.61 34	147 3.06 16	344 9.70 50	1.9 0.03	0.7	0.23	18	1092 1119	377
16S/ 1W- 1B 1 S 4-23-51	--	7.2	2469	--	--	--	--	0	242 3.97	--	470 13.25	270 4.36	--	--	--		888

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C Evap 105°C Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				

SAN DIEGO HYDRO UNIT 20700

LOWER SAN DIEGO HYDRO SUBUNIT 207A0

16S/ 1W- 1B 2 S	--	7.3	1333	93	52	114	--	0	281	152	160	125	--	0.04	--		446
4-23-51				4.64	4.28	4.96			4.61	3.16	4.51	2.02				904	
				33	31	36			32	22	32	14				834	
16S/ 1W- 1B 3 S	--	7.3	1320	88	44	125	2	0	306	147	129	104	--	0.09	54	844	401
4- 9-51				4.39	3.62	5.44	0.05		5.02	3.06	3.64	1.68					
				33	27	40			37	23	27	13				843	
16S/ 1W- 1B 4 S	--	7.5	736	51	25	60	1	0	160	93	63	54	--	0.18	62	487	230
4- 9-51				2.54	2.06	2.61	0.03		2.62	1.94	1.78	0.87					
				35	28	36			36	27	25	12				488	
16S/ 1W- 1E 1 S	--	7.4	1950	125	72	150	3	0	274	94	358	128	--	0.13	61	1126	608
4-11-51				6.24	5.92	6.52	0.08		4.49	1.96	10.10	2.06					
				33	32	35			24	11	54	11				1126	
16S/ 1W- 1G 1 S	--	7.3	1850	174	63	187	2	0	282	416	231	125	0.2	0.12	43	1478	694
11- 6-63				8.68	5.18	8.13	0.05		4.62	8.66	6.51	2.02					
				39	24	37			21	40	30	9				1380	
16S/ 1W- 1G 2 S	--	7.2	1970	127	71	155	2	0	234	202	272	206	--	0.05	58	1210	609
4- 8-51				6.34	5.84	6.74	0.05		3.84	4.21	7.67	3.32					
				33	31	36			20	22	40	17				1206	
16S/ 1W- 1G 3 S	--	7.4	2160	154	79	180	3	0	324	193	358	153	--	0.06	60	1340	710
4-10-51				7.68	6.50	7.83	0.08		5.31	4.02	10.10	2.47					
				35	29	35			24	18	46	11				1339	
16S/ 1W- 1G 5 S	--	7.7	1418	99	49	121	--	0	273	109	181	116	--	0.04	--		449
4-10-51				4.94	4.03	5.26			4.47	2.27	5.10	1.90				935	
				35	28	37			33	17	37	14				811	
16S/ 1W- 1H 1 S	--	7.3	1923	140	80	127	--	0	264	136	334	120	--	0.03	--		679
4-10-51				6.99	6.58	5.52			4.33	2.83	9.42	1.94				1290	
				37	34	29			23	15	51	10				1067	
16S/ 1W- 1H 4 S	--	7.2	1500	113	70	127	2	0	281	237	195	87	0.1	0.30	28	1320	570
10-22-57				5.64	5.76	5.52	0.05		4.61	4.93	5.50	1.40					
				33	34	33			28	30	33	9				998	
16S/ 1W- 1H 7 S	--	7.5	1340	98	55	100	1	0	260	135	161	101	--	0.08	53	832	471
4- 8-51				4.89	4.52	4.35	0.03		4.26	2.81	4.54	1.63					
				35	33	32			32	21	34	12				832	
16S/ 1W- 1K 1 S	--	7.6	1650	104	65	125	2	0	201	83	340	68	--	0.10	59	945	527
4-10-51				5.19	5.35	5.44	0.05		3.29	1.73	9.59	1.10					
				32	33	34			21	11	61	7				945	
16S/ 1W- 1M 1 S	--	7.3	1540	88	47	145	2	0	215	66	305	71	--	0.13	55	885	413
4-11-51				4.39	3.87	6.30	0.05		3.52	1.37	8.60	1.15					
				30	26	43			24	9	59	8				885	
16S/ 1W- 1M 2 S	--	7.3	1380	74	41	140	1	0	193	66	260	78	--	0.12	60	816	353
4-11-51				3.69	3.37	6.09	0.03		3.16	1.37	7.33	1.26					
				28	26	46			24	10	56	10				815	
16S/ 1W- 1M 4 S	--	7.5	1670	104	63	130	1	0	267	95	315	52	--	0.39	50	942	519
4-10-51				5.19	5.18	5.65	0.03		4.38	1.98	8.88	0.84					
				32	32	35			27	12	55	5				942	
16S/ 1W- 2A 1 S	--	7.2	1960	112	71	175	2	0	240	141	358	146	--	0.09	59	1180	572
4-11-51				5.59	5.84	7.61	0.05		3.93	2.94	10.10	2.35					
				29	31	40			20	15	52	12				1182	
16S/ 1W- 2A 2 S	--	7.3	2040	124	76	175	2	0	286	151	370	104	--	0.08	58	1200	622
4-18-51				6.19	6.25	7.61	0.05		4.69	3.14	10.43	1.68					
				31	31	38			24	16	52	8				1201	
16S/ 1W- 2A 3 S	--	7.4	1810	119	70	160	2	0	373	174	246	123	--	0.18	53	1130	585
4-18-51				5.94	5.76	6.96	0.05		6.11	3.62	6.99	1.98					
				32	31	37			33	19	37	11				1133	
16S/ 1W- 2A 4 S	--	7.4	1480	100	59	125	3	0	348	139	175	101	--	0.12	53	926	492
4-18-51				4.99	4.85	5.44	0.08		5.70	2.89	4.94	1.63					
				32	32	35	1		38	19	33	11				926	
16S/ 1W- 2A 5 S	--	7.5	1060	66	43	95	3	0	325	85	98	58	--	0.20	52	660	342
4-18-51				3.29	3.54	4.13	0.08		5.33	1.77	2.76	0.94					
				30	32	37	1		49	16	26	9				660	
16S/ 1W- 2A 6 S	--	7.3	1650	96	61	140	1	0	241	67	318	104	--	0.11	56	962	491
4-12-51				4.79	5.02	6.09	0.03		3.95	1.39	8.97	1.68					
				30	32	38			25	9	56	11				962	
16S/ 1W- 2A 7 S	--	7.6	1670	101	63	119	2	0	256	62	315	88	--	0.14	58	934	511
4-12-51				5.04	5.18	5.17	0.05		4.20	1.29	8.88	1.42					
				33	34	33			27	8	56	9				934	

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in (parts per million / equivalents per million / percent reactance value)									Chemical constituents in parts per million				
LOWER SAN DIEGO HYDRO SUBUNIT 207A0 — SAN DIEGO HYDRO UNIT 20700																	
16S/ 1W- 2A 8 S	--	7.6	1590	93	59	125	2	0	239	58	305	77	--	0.14	54	890	475
4-12-51				4.64	4.85	5.44	0.05		3.92	1.21	8.60	1.24					
				31	32	36			26	8	57	8				891	
16S/ 1W- 2A 9 S	--	8.0	1630	99	62	120	2	0	242	56	315	86	--	0.16	59	918	502
4-16-51				4.94	5.10	5.22	0.05		3.97	1.17	8.88	1.39					
				32	33	34			26	8	58	9				918	
16S/ 1W- 2A10 S	--	7.7	1660	98	62	145	2	0	247	65	318	125	--	0.16	59	995	500
4-16-51				4.89	5.10	6.30	0.05		4.05	1.35	8.97	2.02					
				30	31	39			25	8	55	12				996	
16S/ 1W- 2A12 S	--	7.3	1290	69	46	115	1	0	211	60	238	55	--	0.08	57	745	361
4-16-51				3.44	3.78	5.00	0.03		3.46	1.25	6.71	0.89					
				28	31	41			28	10	55	7				745	
16S/ 1W- 2A13 S	--	7.6	1310	75	49	115	1	0	221	88	215	76	--	0.08	54	782	389
4-16-51				3.74	4.03	5.00	0.03		3.62	1.83	6.06	1.23					
				29	31	39			28	14	48	10				782	
16S/ 1W- 2A15 S	--	8.1	1700	121	75	119	3	0	340	188	228	85	--	0.20	58	1040	611
4-12-51				6.04	6.17	5.17	0.08		5.57	3.91	6.43	1.37					
				35	35	30			32	23	37	8				1044	
16S/ 1W- 2A16 S	--	7.9	1370	89	54	126	3	0	322	133	167	73	--	0.14	54	857	444
4-18-51				4.44	4.44	5.48	0.08		5.28	2.77	4.71	1.18					
				31	31	38	1		38	20	34	8				857	
16S/ 1W- 2A18 S	--	7.6	1240	78	51	105	4	0	349	107	127	74	--	0.17	57	775	404
4-18-51				3.89	4.19	4.57	0.10		5.72	2.23	3.58	1.19					
				31	33	36	1		45	18	28	9				775	
16S/ 1W- 2B 2 S	--	7.6	1130	57	37	110	2	0	165	48	231	5.5	--	0.05	29	610	294
4-17-51				2.84	3.04	4.78	0.05		3.03	1.00	6.51	0.09					
				27	28	45			29	9	61	1				610	
16S/ 1W- 2D 1 S	--	7.5	1912	103	62	196	--	0	164	104	467	47.7	--	0.11	--		512
4-24-51				5.14	5.10	8.52			2.69	2.17	13.17	0.77				1462	
				27	27	45			14	12	70	4				1060	
16S/ 1W- 2D 2 S	--	--	1658	--	--	--	--	0	159	--	395	41	--	--	--		
4-24-51									2.61		11.14	0.66					
16S/ 1W- 2D 3 S	--	--	1577	--	--	--	--	0	156	--	385	43	--	--	--		
4-25-51									2.56		10.86	0.69					
16S/ 1W- 2D 4 S	--	7.2	1650	89	46	161	--	0	158	46	374	54	--	0.06	--		411
4-25-51				4.44	3.78	7.00			2.59	0.96	10.55	0.87				1142	
				29	25	46			17	6	70	6				848	
16S/ 1W- 2D 5 S	--	7.5	1430	83	50	105	3	0	120	36	330	44	--	0.20	58	768	413
4-17-51				4.14	4.11	4.57	0.08		1.97	0.75	9.31	0.71					
				32	32	35	1		15	6	73	6				768	
16S/ 1W- 2D 6 S	--	7.2	1640	92	53	150	1	0	183	48	370	67	--	0.10	67	938	448
4-17-51				4.59	4.36	6.52	0.03		3.00	1.00	10.43	1.08					
				30	28	42			19	6	67	7				938	
16S/ 1W- 2D 7 S	--	7.4	1374	86	50	123	--	0	134	42	380	50	--	0.10	--		420
4-25-51				4.29	4.11	5.35			2.20	0.87	10.72	0.81				1182	
				31	30	39			15	6	73	6				797	
16S/ 1W- 2E 1 S	--	8.0	1678	87	45	177	--	0	185	98	373	29	--	0.08	--		402
4- 4-51				4.34	3.70	7.70			3.03	2.04	10.52	0.47				1117	
				28	24	49			19	13	66	3				900	
16S/ 1W- 2E 2 S	--	7.6	1695	--	--	--	--	0	193	--	402	10	--	--	--		416
4-23-51									3.16		11.34	0.16					
16S/ 1W- 2E 3 S	--	7.6	1698	--	--	--	--	0	234	--	470	38	--	--	--		492
4-23-51									3.84		13.25	0.61					
16S/ 1W- 2E 4 S	--	7.4	1669	85	48	180	--	0	178	87	400	32	--	0.09	--		410
6- 5-51				4.24	3.95	7.83			2.92	1.81	11.28	0.52				1209	
				26	25	49			18	11	68	3				920	
16S/ 1W- 2F 1 S	--	7.4	1610	108	63	115	2	0	255	68	350	8.3	--	0.20	61	901	529
4-17-51				5.39	5.16	5.00	0.05		4.18	1.42	9.87	0.13					
				35	33	32			27	9	63	1				901	
16S/ 1W- 2F 2 S	--	7.[illegible]	1479	79	40	142	--	0	144	37	335	35	--	0.06	--		362
4- 3-51				3.94	3.29	6.17			2.36	0.77	9.45	0.56				1012	
				29	25	46			18	6	72	4				739	
16S/ 1W- 2F 3 S	--	7.9	1430	76	38	140	1	0	142	51	322	32	--	0.10	64	794	346
4- 4-51				3.79	3.13	6.09	0.03		2.33	1.06	9.08	0.52					
				29	24	47			18	8	70	4				794	

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
LOWER SAN DIEGO HYDRO SUBUNIT 207A0				SAN DIEGO HYDRO UNIT 20700													
16S/ 1W- 2G 1 S	--	7.5	1300	70	37	125	1	0	136	54	289	26	--	0.07	52	721	327
4-17-51				3.49	3.04	5.44	0.03		2.23	1.12	8.15	0.42					
				29	25	45			19	9	68	4				721	
16S/ 1W- 2G 2 S	--	7.5	1440	83	43	125	1	0	170	49	305	48	--	0.10	58	796	384
4-17-51				4.14	3.54	5.44	0.03		2.79	1.02	8.60	0.77					
				31	27	41			21	8	65	6				796	
16S/ 1W- 2G 3 S	--	8.1	1390	79	51	120	2	0	153	68	291	50	--	0.14	29	765	407
4-17-51				3.94	4.19	5.22	0.05		2.51	1.42	8.21	0.81					
				29	31	39			19	11	63	6				765	
16S/ 1W- 2G 4 S	--	7.4	1260	75	42	110	1	0	173	57	239	68	--	0.06	58	736	360
4-17-51				3.74	3.45	4.78	0.03		2.84	1.19	6.74	1.10					
				31	29	40			24	10	57	9				735	
16S/ 1W- 2H 1 S	--	7.6	1940	114	63	185	2	0	299	79	348	171	--	0.10	60	1170	544
4-12-51				5.69	5.18	8.04	0.05		4.90	1.64	9.81	2.76					
				30	27	42			26	9	51	14				1169	
16S/ 1W- 2H 2 S	--	8.0	1790	106	63	176	2	0	302	82	325	94	--	0.14	59	1060	524
4-16-51				5.29	5.18	7.65	0.05		4.95	1.71	9.17	1.52					
				29	29	42			29	10	53	9				1056	
16S/ 1W- 2H 3 S	--	7.8	1430	82	46	140	2	0	204	68	277	56	--	0.16	61	832	394
4-16-51				4.09	3.78	6.09	0.05		3.34	1.42	7.81	0.90					
				29	27	43			25	11	58	7				832	
16S/ 1W- 2H 4 S	--	7.4	1370	82	46	125	1	0	187	66	270	66	--	0.10	58	806	394
4-16-51				4.09	3.78	5.44	0.03		3.06	1.37	7.61	1.06					
				31	28	41			23	10	58	8				806	
16S/ 1W- 2J 1 S	--	7.6	1590	93	52	168	2	0	311	118	250	76	--	0.20	56	968	446
3-27-51				4.64	4.28	7.30	0.05		5.10	2.46	7.05	1.23					
				29	26	45			32	16	45	8				968	
16S/ 1W- 2J 2 S	--	7.5	1410	76	45	125	2	0	178	49	293	42	--	0.13	57	777	375
3-27-51				3.79	3.70	5.44	0.05		2.92	1.02	8.26	0.68					
				29	29	42			23	8	64	5				777	
16S/ 1W- 2K 2 S	--	7.5	2140	141	76	165	2	0	254	93	430	96	--	0.27	58	1190	665
3-28-51				7.04	6.25	7.17	0.05		4.16	1.94	12.13	1.55					
				34	30	35			21	10	61	8				1186	
16S/ 1W- 2K 3 S	--	7.7	1780	111	55	155	1	0	188	54	402	76	--	0.14	58	1010	503
3-28-51				5.54	4.52	6.74	0.03		3.08	1.12	11.34	1.23					
				33	27	40			18	7	68	7				1005	
16S/ 1W- 2K 4 S	--	8.0	2141	122	67	214	--	0	229	102	479	79	--	0.06	--		580
3-28-51				6.09	5.51	9.30			3.75	2.12	13.51	1.27				1400	
				29	26	44			18	10	65	6				1176	
16S/ 1W- 2K 5 S	--	7.8	1620	98	55	135	3	0	236	77	303	73	--	0.13	56	916	471
4-17-51				4.89	4.52	5.87	0.08		3.87	1.60	8.54	1.18					
				32	29	38	1		25	11	56	8				916	
16S/ 1W- 2K 6 S	--	7.4	1950	112	62	225	1	0	250	158	399	106	0.2	0.18	43	1396	535
11- 6-63				5.59	5.10	9.78	0.03		4.10	3.29	11.25	1.71					
				27	25	48			20	16	55	8				1229	
16S/ 1W- 2L 1 S	--	7.6	1640	89	49	170	1	0	201	71	350	89	--	0.23	66	984	424
3-28-51				4.44	4.03	7.39	0.03		3.29	1.48	9.87	1.44					
				28	25	47			20	9	61	9				984	
16S/ 1W- 2L 3 S	--	7.2	1070	53	20	125	1	0	116	42	245	2.0	--	0.38	15	560	214
4- 2-51				2.64	1.64	5.44	0.03		1.90	0.87	6.91	0.03					
				27	17	56			20	9	71					560	
16S/ 1W- 2L 4 S	--	8.2	1548	89	43	152	--	0	183	47	339	46	--	0.05	--		399
4- 2-51				4.44	3.54	6.61			3.00	0.98	9.56	0.74				1040	
				30	24	45			21	7	67	5				806	
16S/ 1W- 2L 5 S	--	8.2	1274	73	26	129	--	10	134	39	277	18	--	0.18	--		289
4- 2-51				3.64	2.14	5.61		0.33	2.20	0.81	7.81	0.29				818	
				32	19	49		3	19	7	68	3				638	
16S/ 1W- 2L 7 S	--	8.1	1499	74	42	164	--	0	224	48	308	38	--	0.06	--		357
4- 3-51				3.69	3.45	7.13			3.67	1.00	8.69	0.61				948	
				26	24	50			26	7	62	4				784	
16S/ 1W- 2L 8 S	--	7.6	949	40	14	121	--	0	107	50	205	4.0	--	0.24	--		158
4- 3-51				2.00	1.15	5.26			1.75	1.04	5.78	0.06				518	
				24	14	63			20	12	67	1				487	
16S/ 1W- 2L 9 S	--	7.2	1506	78	39	156	--	0	234	59	318	24	--	0.10	--		355
4- 3-51				3.89	3.21	6.78			3.84	1.23	8.97	0.39				1002	
				28	23	49			27	9	62	3				789	
16S/ 1W- 2L11 S	--	7.4	1540	91	43	150	1	0	98	76	330	27	--	0.22	64	880	404
4- 5-51				4.54	3.54	6.52	0.03		1.61	1.58	9.31	0.44					
				31	24	45			12	12	72	3				830	

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
LOWER SAN DIEGO HYDRO SUBUNIT 207A0				SAN DIEGO HYDRO UNIT 20700													
16S/ 1W- 2L12 S	--	8.0	1530	92	40	145	1	0	156	74	345	26	--	0.21	43	843	394
4- 3-51				4.59	3.29	6.30	0.03		2.56	1.54	9.73	0.42					
				32	23	44			18	11	68	3				843	
16S/ 1W- 2L13 S	--	8.0	1508	78	41	156	--	0	178	45	326	46	--	0.06	--		363
4- 3-51				3.89	3.37	6.78			2.92	0.94	9.19	0.74				1071	
				28	24	48			21	7	67	5				780	
16S/ 1W- 2L14 S	--	7.6	2045	108	61	206	--	0	271	48	451	64	--	0.05	--		521
4- 4-51				5.39	5.02	8.96			4.44	1.00	12.72	1.03				1407	
				28	26	46			23	5	66	5				1071	
16S/ 1W- 2L15 S	--	7.5	1992	114	60	204	--	0	305	50	417	51	--	0.12	--		531
4- 4-51				5.69	4.93	8.87			5.00	1.04	11.76	0.82				1263	
				29	25	46			27	6	63	4				1046	
16S/ 1W- 2L16 S	--	7.4	1282	72	35	128	--	0	161	36	281	18	--	0.20	--		324
4- 3-51				3.59	2.88	5.57			2.64	0.75	7.92	0.29				867	
				30	24	46			23	6	68	3				649	
16S/ 1W- 2L17 S	--	7.7	1026	43	10	130	--	0	117	59	196	2.5	--	0.17	--		149
1-11-51				2.15	0.82	5.65			1.92	1.23	5.53	0.04				620	
				25	10	66			22	14	63					498	
16S/ 1W- 2L18 S	--	7.5	1760	104	53	156	1	0	231	82	362	29	--	0.06	53	974	478
4- 3-51				5.19	4.36	6.78	0.03		3.79	1.71	10.77	0.47					
				32	27	41			23	10	64	3				974	
16S/ 1W- 2M 1 S	--	7.4	2250	130	68	230	1	0	276	98	505	48	--	0.18	72	1290	604
4- 4-51				6.49	5.59	10.00	0.03		4.52	2.04	14.24	0.77					
				29	25	45			21	9	66	4				1288	
16S/ 1W- 2P 1 S	--	7.6	2066	108	63	215	--	0	227	48	520	71	--	0.15	--		529
4- 3-51				5.39	5.18	9.35			3.72	1.00	14.66	1.15				1542	
				27	26	47			18	5	71	6				1137	
16S/ 1W- 2Q 1 S	--	8.1	1565	83	48	157	--	0	220	57	324	57	--	0.11	--		405
3-28-51				4.14	3.95	6.83			3.61	1.19	9.14	0.92				1000	
				28	26	46			24	8	62	6				834	
16S/ 1W- 2Q17 S	--	7.3	1786	94	59	177	--	0	205	66	420	64	--	0.15	--		477
9-20-51				4.69	4.85	7.70			3.36	1.37	11.84	1.03				1358	
				27	28	45			19	8	67	6				981	
16S/ 1W- 2Q24 S	--	7.7	990	46	11	133	--	0	132	56	222	0	--	0.12	--		160
0- 0-51				2.30	0.90	5.78			2.16	1.17	6.26					613	
				26	10	64			23	12	65					533	
16S/ 1W- 3A 1 S	--	7.2	2155	--	--	--	--	0	223	--	565	37	--	--	--		592
5- 1-51									3.65		15.93	0.60					
16S/ 1W- 3A 2 S	--	7.3	1988	--	--	--	--	0	208	--	462	48	--	--	--		536
4-24-51									3.41		13.03	0.77					
16S/ 1W- 3A 4 S	--	--	1709	--	--	--	--	0	178	--	400	41	--	--	--		
4-24-51									2.92		11.28	0.66					
16S/ 1W- 3A 5 S	--	7.2	1695	--	--	--	--	0	183	--	415	43	--	--	--		410
4-24-51									3.00		11.70	0.69					
16S/ 1W- 3B 1 S	--	7.3	2564	--	--	--	--	0	239	--	690	60	--	--	--		716
4-30-51									3.92		19.46	0.97					
16S/ 1W- 3B 2 S	--	7.5	2625	171	80	234	--	0	227	66	690	103	--	0.07	--		756
5- 1-51				8.53	6.58	10.17			3.72	1.37	19.46	1.66				1998	
				34	26	40			14	5	74	6				1456	
16S/ 1W- 3B 3 S	--	8.4	2360	148	72	255	0	12	228	121	572	41	0	0.07	54	1390	666
5- 1-51				7.39	5.92	11.09		0.40	3.74	2.52	16.13	0.66					
				30	24	45		2	16	11	69	3				1387	
16S/ 1W- 3B 4 S	--	7.3	2703	181	95	227	--	0	220	78	755	38.7	--	0.16	--		843
5- 1-51				9.03	7.81	9.87			3.61	1.62	21.29	0.62				2353	
				34	29	37			13	6	76	2				1483	
16S/ 1W- 3B 5 S	--	--	2825	--	--	--	--	0	229	--	780	44	--	--	--		
5- 1-51									3.75		22.00	0.71					
16S/ 1W- 3B 6 S	--	--	3058	--	--	--	--	0	210	--	820	59	--	--	--		
5- 1-51									3.44		23.12	0.95					
16S/ 1W- 3B 7 S	--	7.8	3584	234	116	326	--	0	251	121	990	103	--	0.11	--		1062
5- 1-51				11.68	9.54	14.17			4.11	2.52	27.92	1.66				3152	
				33	27	40			11	7	77	5				2014	

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C Evap 105°C Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
SAN DIEGO HYDRO UNIT 20700																	
LOWER SAN DIEGO HYDRO SUBUNIT 207A0																	
16S/ 1W- 3C 1 S	--	7.6	3360	230	114	285	2	0	278	82	892	71	0	0.13	55	1870	1044
5- 1-51				11.48	9.38	12.39	0.05		4.56	1.71	25.15	1.15					
				34	28	37			14	5	77	4				1868	
16S/ 1W- 3C 2 S	--	7.5	1750	93	38	240	3	0	221	85	446	1.0	0.4	0.14	23	1192	389
12- 4-62				4.64	3.13	10.44	0.08		3.62	1.77	12.58	0.02					
				25	17	57			20	10	70					1038	
16S/ 1W- 3E 1 S	74	7.8	1360	75	38	165	3	0	184	59	339	4.0	0.4	0.27	36	880	344
12- 4-62				3.74	3.13	7.17	0.08		3.02	1.23	9.56	0.06					
				26	22	51	1		22	9	69					810	
16S/ 1W- 3G 1 S	--	--	2262	--	--	--	--	0	249	--	555	47	--	--	--		
4-24-51									4.08		15.65	0.76					
16S/ 1W- 3G 2 S	--	7.3	1930	99	49	209	--	0	256	58	460	25	--	0	--		449
4-24-51				4.94	4.03	9.09			4.20	1.21	12.97	0.40				1193	
				27	22	50			22	6	69	2				1026	
16S/ 1W- 3G 3 S	--	8.4	1830	93	46	214	2	12	232	73	425	9.5	0.4	0.43	53	1040	421
4-30-51				4.64	3.78	9.30	0.05	0.40	3.80	1.52	11.99	0.15					
				26	21	52		2	21	9	67	1				1042	
16S/ 1W- 3G 4 S	--	8.2	2232	--	--	--	--	0	268	--	595	31	--	--	--		560
4-30-51									4.39		16.78	0.50					
16S/ 1W- 3G 5 S	--	7.5	2688	157	87	267	--	0	220	85	720	64.5	--	0.11	--		750
4-30-51				7.83	7.15	11.61			3.61	1.77	20.30	1.04				2126	
				29	27	44			14	7	76	4				1489	
16S/ 1W- 3G 6 S	--	7.5	2114	--	--	--	--	0	241	--	605	54	--	--	--		608
4-30-51									3.95		17.06	0.87					
16S/ 1W- 3G 7 S	--	--	2597	--	--	--	--	0	212	--	665	65	--	--	--		
4-30-51									3.47		18.75	1.05					
16S/ 1W- 3H 1 S	--	7.5	2146	128	62	205	--	0	244	70	520	50	--	0.10	--	1562	575
4-24-51				6.39	5.10	8.91			4.00	1.46	14.66	0.81					
				31	25	44			19	7	70	4				1155	
16S/ 1W- 3H 2 S	--	--	2237	--	--	--	--	0	237	--	560	57	--	--	--		
4-23-51									3.88		15.79	0.92					
16S/ 1W- 3H 4 S	--	7.2	2597	154	77	254	--	0	307	91	610	53	--	0.13	--		701
4-24-51				7.68	6.33	11.04			5.03	1.89	17.20	0.85				1691	
				31	25	44			20	8	69	3				1390	
16S/ 1W- 3H 6 S	--	--	1961	--	--	--	--	0	171	--	480	44	--	--	--		
4-24-51									2.80		13.54	0.71					
16S/ 1W- 3J 1 S	--	7.2	2300	138	80	242	1	0	253	82	610	8.9	0.2	0.30	31	2180	674
10-22-57				6.89	6.58	10.52	0.03		4.15	1.71	17.20	0.14					
				29	27	44			18	7	74	1				1318	
16S/ 1W- 3K 1 S	--	7.2	2185	122	58	229	--	0	271	123	505	49	--	0.08	--		543
4-24-51				6.09	4.77	9.96			4.44	2.56	14.24	0.79				1375	
				29	23	48			20	12	65	4				1219	
16S/ 1W- 3K 3 S	--	8.1	4730	320	173	455	3	0	341	178	1370	156	0.2	0.10	52		1511
4-19-55				15.97	14.23	19.78	0.08		5.59	3.71	38.63	2.52				3131	
				32	28	40			11	7	77	5				2875	
16S/ 1W- 3K 4 S	--	7.0	4651	305	151	384	--	0	342	120	1220	142	--	0	--		1383
1-12-51				15.22	12.42	16.70			5.61	2.50	34.40	2.29				2940	
				34	28	38			13	6	77	5				2490	
16S/ 1W- 3K 5 S	--	7.5	4850	310	133	520	2	0	417	177	1320	73.2	0.1	0.30	--		1322
2- 7-53				15.47	10.94	22.61	0.05		6.83	3.69	37.22	1.18				3538	
				32	22	46			14	8	76	2				2741	
16S/ 1W- 3M 1 S	66	8.0	1280	62	24	158	4	0	164	50	293	6.2	--	0	--		253
2- 5-53				3.09	1.97	6.87	0.10		2.69	1.04	8.26	0.10				741	
				25	16	57	1		22	9	68	1				678	
16S/ 1W- 3N 1 S	78	8.1	1072	78	44	126	6	0	174	56	323	22	0.2	0.11	35	861	376
11-16-58				3.89	3.62	5.48	0.15		2.85	1.17	9.11	0.35					
				30	28	42	1		21	9	66	3				776	
16S/ 1W- 30 1 S	73	7.3	2580	156	83	238	10	0	342	92	555	103.0	0.1	0.18	--		731
8- 2-56				7.78	6.83	10.35	0.26		5.61	1.92	15.65	1.66				1670	
				31	27	41	1		23	8	63	7				1405	
16S/ 1W- 30 3 S	--	7.3	3676	234	123	354	--	0	332	110	955	138	--	0.09	--		1091
0- 0-51				11.68	10.12	15.39			5.44	2.29	26.93	2.23				2859	
				31	27	41			15	6	73	6				2077	

State well number Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C Evap 105°C Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
SAN DIEGO HYDRO UNIT 20700																	
LOWER SAN DIEGO HYDRO SUBUNIT 207A0																	
16S/ 1W- 3R 1 S 5- 7-51	--	6.7	1821	99 4.94 27	51 4.19 23	207 9.00 50	--	0	337 5.52 29	38 0.79 4	435 12.27 65	11.4 0.18 1	--	0.08	--	 1255 1007	457
16S/ 1W-10A 1 S 5- 7-51	--	7.5	2218	131 6.54 32	70 5.76 28	186 8.09 40	--	0	256 4.20 20	89 1.85 9	505 14.24 67	63 1.02 5	--	0	--	 1454 1170	615
16S/ 1W-10A 2 S 4-18-56	60	7.9	1111	100 4.99 39	34 2.80 22	115 5.00 39	5 0.13 1	0	171 2.80 21	343 7.14 55	108 3.05 23	4.5 0.07 1	0.6	0.22	10	 675 604	390
16S/ 1W-10A 3 S 5- 7-51	--	--	2137	--	--	--	--	0	198 3.25	--	570 16.07	47 0.76	--	--	--		
16S/ 1W-10B 1 S 1-12-51	--	7.6	3546	177 8.83 24	74 6.09 16	507 22.04 60	--	0	342 5.61 15	116 2.42 6	1060 29.89 78	31 0.50 1	--	0.14	--	 2294 2133	747
16S/ 1W-10D 1 S 4-12-60	74	7.9	1372	62 3.09 24	29 2.38 19	166 7.22 56	5 0.13 1	--	168 2.75 22	42 0.87 7	312 8.80 70	9.7 0.16 1	0.5	0.19	21	816 730	274
16S/ 1W-10E 1 S 5- 2-51	--	8.1	1490	60 2.99 22	22 1.81 13	205 8.91 65	2 0.05	0	156 2.56 18	66 1.37 10	354 9.98 72	0	0.5	0.35	29	815 816	240
16S/ 1W-10E 2 S 12-15-59	--	7.5	1256	68 3.39 30	25 2.06 18	133 5.78 51	5 0.13 1	0	167 2.74 25	92 1.92 17	228 6.43 58	2 0.03	0.4	0.16	25	600 661	273
16S/ 1W-10F 1 S 1- 4-50	--	--	--	47 2.35 20	14 1.15 10	188 8.17 70	--	0	205 3.36 29	59 1.23 11	252 7.11 61	0	--	--	31	720 692	175
16S/ 1W-10G 1 S 5- 7-51	--	7.6	4901	293 14.62 30	130 10.69 22	552 24.00 49	--	0	376 6.16 13	85 1.77 4	1375 38.78 80	92 1.48 3	--	0.16	--	 3706 2712	1267
16S/ 1W-10G 2 S 1-12-51	--	7.0	8850	484 24.15 25	199 16.37 17	1306 56.78 58	--	0	356 5.83 6	307 6.39 6	3120 87.98 87	58 0.94 1	--	0.16	--	 6005 5649	2028
16S/ 1W-11A 2 S 9-20-51	--	7.9	1608	84 4.19 26	53 4.36 27	173 7.52 47	--	0	256 4.20 26	67 1.39 9	345 9.73 61	44 0.71 4	--	0.03	--	 1075 892	428
16S/ 1W-11B 4 S [illegible]- 0-51	--	--	893	--	--	--	--	--	--	--	168 4.74	0.5 0.01	--	--	--		
16S/ 1W-11B 5 S 9-20-51	--	8.0	1754	92 4.59 26	52 4.28 24	199 8.65 49	--	0	290 4.75 27	86 1.79 10	375 10.58 60	30 0.48 3	--	0.13	--	 1216 977	444
16S/ 1W-11F 1 S 7-13-51	--	8.4	1920	95 4.74 26	65 5.35 29	190 8.26 45	1 0.03	0	187 3.06 17	66 1.37 8	438 12.35 69	71 1.15 6	0.2	0.10	64	1080 1082	505
16S/ 1W-11G 1 S 8- 1-51	--	7.5	2230	160 7.98 38	81 6.66 32	141 6.13 30	--	0	251 4.11 19	61 1.27 6	535 15.09 69	89 1.44 7	--	0	--	 1672 1190	733
16S/ 1W-11J 1 S 5-17-51	--	7.3	3058	180 8.98 30	97 7.98 26	306 13.30 44	--	0	237 3.88 13	107 2.23 7	810 22.84 74	115 1.85 6	--	0.16	--	 2265 1732	849
16S/ 1W-11J 2 S 5-16-51	--	7.2	2132	--	--	--	--	0	283 4.64	--	525 14.81	59 0.95	--	--	--		632
16S/ 1W-11J 4 S 5-16-51	--	7.9	1709	--	--	--	--	0	181 2.97	--	435 12.27	44 0.71	--	--	--		500
16S/ 1W-11J 5 S 5-16-51	--	7.9	2451	150 7.49 31	98 8.06 33	204 8.87 36	--	0	242 3.97 16	89 1.85 6	611 17.23 71	80 1.29 5	--	0.20	--	 1924 1351	778
16S/ 1W-11J 7 S 5-16-51	--	--	2026	--	--	--	--	0	246 4.03	--	500 14.10	61 0.98	--	--	--		
16S/ 1W-11P 1 S 5-14-51	--	8.2	1825	--	--	--	--		342 5.61	--	390 11.00	70 1.13	--	--	--		448
16S/ 1W-11P 3 S 5-14-51	--	7.4	3106	185 9.23 30	98 8.06 26	310 13.48 44	--	0	239 3.92 12	115 2.39 7	830 23.41 73	140 2.26 7	--	0.10	--	 2645 1796	865

State well number Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C Evap 105°C Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
LOWER SAN DIEGO HYDRO SUBUNIT 207A0				SAN DIEGO HYDRO UNIT							20700						
16S/ 1W-11P 4 S 11- 6-63	--	7.3	3000	212 10.58 32	75 6.17 19	365 15.87 49	2 0.05	0	261 4.28 13	151 3.14 10	819 23.10 71	111 1.79 6	0.4	0.20	42	2242 1906	838
16S/ 1W-11R 1 S 5-17-51	--	--	1639	--	--	--	--	0	205 3.36	--	365 10.29	73 1.18	--	--	--		
16S/ 1W-11R 2 S 5-16-51	--	7.9	1520	68 3.39 22	53 4.36 29	166 7.22 48	5 0.13 1	0	271 4.44 30	91 1.89 13	276 7.78 52	48 0.77 5	0.3	0.15	53	894 894	388
16S/ 1W-11R 3 S 5-17-51	--	--	3003	--	--	--	--	0	244 4.00	--	785 22.14	108 1.74	--	--	--		
16S/ 1W-12A 1 S 5-16-51	--	7.0	2910	191 9.53 31	111 9.13 30	273 11.87 39	--	0	354 5.80 18	190 3.96 12	725 20.45 63	147 2.37 7	--	0	--	 1972 1811	934
16S/ 1W-12A 2 S 5-16-51	--	7.6	1848	--	--	--	--	0	317 5.20	--	362 10.21	86 1.39	--	--	--		512
16S/ 1W-12B 1 S 9-20-51	--	7.6	1344	68 3.39 26	40 3.29 25	145 6.30 49	--	0	237 3.88 29	44 0.92 7	275 7.76 59	39.7 0.64 5	--	0.07	--	 889 728	334
16S/ 1W-12F 1 S 6- 6-51	--	8.0	1866	--	--	--	--	0	238 3.90	--	436 12.30	37 0.60	--	--	--		516
16S/ 1W-12G 2 S 5-16-51	--	7.1	1949	110 5.49 29	78 6.41 34	160 6.96 37	--	0	224 3.67 19	76 1.58 8	460 12.97 68	49 0.79 4	--	0.09	--	 1574 1043	595
16S/ 1W-12G 3 S 6- 6-51	--	7.9	2188	--	--	--	--	0	344 5.64	--	495 13.96	52 0.84	--	--	--		672
16S/ 1W-12G 4 S 5-16-51	--	--	1848	--	--	--	--	0	273 4.47	--	420 11.84	52 0.84	--	--	--		
16S/ 1W-12G 5 S 1-11-51	--	7.9	2140	108 5.39 26	81 6.66 32	200 8.70 42	3 0.08	0	258 4.23 20	94 1.96 9	462 13.03 63	98 1.58 8	--	0.07	59	1230 1232	603
16S/ 1W-12G 6 S 5-14-51	--	7.3	1934	--	--	--	--	0	231 3.79	--	480 13.54	62 1.00	--	--	--		592
16S/ 1W-12H 1 S 5-16-51	--	--	2217	--	--	--	--	0	293 4.80	--	500 14.10	91 1.47	--	--	--		
16S/ 1W-12H 3 S 5-15-51	--	--	1961	--	--	--	--	0	285 4.67	--	425 11.99	69 1.11	--	--	--		
16S/ 1W-12H 4 S 5-15-51	--	7.4	1916	106 5.29 28	71 5.84 31	177 7.70 41	--	0	317 5.20 26	72 1.50 8	425 11.99 61	59 0.95 5	--	0.08	--	 1216 1066	557
16S/ 1W-12H 5 S 5-16-51	--	7.1	2137	--	--	--	--	0	337 5.52	--	490 13.82	71 1.15	--	--	--		652
16S/ 1W-12H 6 S 5-15-51	--	--	1718	--	--	--	--	0	246 4.03	--	380 10.72	44 0.71	--	--	--		
16S/ 1W-12J 1 S 5-14-51	--	--	1658	--	--	--	--	0	215 3.52	--	345 9.73	110 1.77	--	--	--		
16S/ 1W-12J 2 S 5-15-51	--	--	1045	--	--	--	--	0	220 3.61	--	180 5.08	64 1.03	--	--	--		
16S/ 1W-12J 3 S 11- 6-63	--	7.4	3050	253 12.62 37	153 12.58 37	207 9.00 26	5 0.13	0	195 3.20 9	192 4.00 12	840 23.69 70	190 3.06 9	0.2	0.23	40	2268 1976	1261
16S/ 1W-12J 4 S 11-16-58	--	7.5	1805	115 5.74 31	84 6.91 38	129 5.61 31	5 0.13 1	--	185 3.03 17	75 1.56 9	426 12.01 67	88 1.42 8	0.3	0	50	1464 1063	633
16S/ 1W-12J 5 S 5-15-51	--	7.2	2280	126 6.29 30	75 6.17 29	202 8.78 41	--	0	200 3.28 15	68 1.42 6	575 16.22 74	58 0.94 4	--	0	--	 1585 1202	623

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C Evap 105°C Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million, equivalents per million, percent reactance value									Chemical constituents in parts per million				
SAN DIEGO HYDRO UNIT 207.00																	
LOWER SAN DIEGO HYDRO SUBUNIT 207A0																	
16S/ 1W-12J 6 S	--	--	2137	--	--	--	--	0	203	--	525	61	--	--	--		
5-15-51									3.33		14.81	0.98					
16S/ 1W-12K 1 S	--	--	1513	--	--	--	--	0	193	--	320	80	--	--	--		
5-14-51									3.16		9.02	1.29					
16S/ 1W-12K 2 S	--	8.0	1205	--	--	--	--	0	238	--	214	70	--	--	--		360
5-14-51									3.90		6.03	1.13					
16S/ 1W-12K 3 S	--	7.2	1368	--	--	--	--	0	237	--	260	55	--	--	--		444
5-14-51									3.88		7.33	0.89					
16S/ 1W-12K 4 S	--	--	1424	--	--	--	--	0	212	--	300	48	--	--	--		
5-14-51									3.47		8.46	0.77					
16S/ 1W-12K 5 S	--	--	1049	--	--	--	--	0	198	--	210	41	--	--	--		
5-14-51									3.25		5.92	0.66					
16S/ 1W-12K 6 S	--	7.5	926	43	42	79	--	0	156	37	200	35.3	--	0.12	--		260
5-14-51				2.15	3.45	3.43			2.56	0.77	5.64	0.57				681	
				24	38	38			27	8	59	6				513	
16S/ 1W-12L 1 S	--	7.4	1020	54	43	82	2	0	149	37	207	43	0.5	0.12	70	612	312
5-22-51				2.69	3.54	3.57	0.05		2.44	0.77	5.84	0.69					
				27	36	36	1		25	8	60	7				612	
16S/ 1W-12M 1 S	--	8.0	2140	129	87	166	4	0	125	50	580	41	0	0.11	61	1180	680
5-22-51				6.44	7.15	7.22	0.10		2.05	1.04	16.36	0.66					
				31	34	35			10	5	81	3				1180	
16S/ 1W-12M 2 S	--	7.3	2063	118	86	150	--	0	274	83	480	79	--	0	--		649
5-23-51				5.89	7.07	6.52			4.49	1.73	13.54	1.27				1516	
				30	36	33			21	8	64	6				1131	
16S/ 1W-12N 1 S	--	7.1	3650	218	122	354	--	0	288	101	965	121	--	0.26	--		1046
5-17-51				10.88	10.03	15.39			4.72	2.10	27.21	1.95				2743	
				30	28	42			13	6	76	5				2023	
16S/ 1W-12N 2 S	--	7.8	2530	123	78	285	2	0	208	79	655	32	0.2	0.17	62	1420	628
6- 7-51				6.14	6.41	12.39	0.05		3.41	1.64	18.47	0.52					
				25	26	50			14	7	77	2				1419	
16S/ 1W-12N 3 S	--	8.2	1109	--	--	--	--	0	220	--	196	68	--	--	--		252
5-22-51									3.61		5.53	1.10					
16S/ 1W-12P 1 S	--	7.9	760	65	16	89	1	0	336	90	20	29	2.0	0.15	20	496	228
5-28-51				3.24	1.32	3.87	0.03		5.51	1.87	0.56	0.47					
				38	16	46			66	22	7	6				497	
16S/ 1W-12P 2 S	--	7.9	3003	176	112	272	--	0	218	140	775	126	--	0.04	--		900
5-22-51				8.78	9.21	11.83			3.57	2.91	21.86	2.03				3003	
				29	31	40			12	10	72	7				1708	
16S/ 1W-12P 3 S	--	7.7	1575	--	--	--	--	0	156	--	385	112	--	--	--		456
5-22-51									2.56		10.86	1.81					
16S/ 1W-12P 4 S	--	7.6	1242	--	--	--	--	0	244	--	226	56	--	--	--		236
5-28-51									4.00		6.37	0.90					
16S/ 1W-12Q 3 S	--	7.6	1866	--	--	--	--	0	195	--	510	39	--	--	--		564
6- 7-51									3.20		14.38	0.63					
16S/ 1W-12Q 4 S	--	7.6	1934	--	--	--	--	0	168	--	535	43	--	--	--		572
6- 7-51									2.75		15.09	0.69					
16S/ 1W-12Q 6 S	--	--	1669	--	--	--	--	0	198	--	425	117	--	--	--		
5-28-51									3.25		11.99	1.89					
16S/ 1W-12Q 8 S	--	7.4	1036	38	27	142	--	0	198	42	202	21	--	0.20	--		206
1-12-51				1.90	2.22	6.17			3.25	0.87	5.70	0.34				600	
				18	22	60			32	9	56	3				570	
16S/ 1W-12Q10 S	--	8.0	1040	51	39	102	3	0	214	57	161	63	0.2	0.60	58	640	288
6-19-51				2.54	3.21	4.43	0.08		3.51	1.19	4.54	1.02					
				25	31	43	1		34	12	44	10				640	

State well number Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C Evap 105°C Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
SAN DIEGO HYDRO UNIT Z0700																	
LOWER SAN DIEGO HYDRO SUBUNIT Z07A0																	
16S/ 1W-12R 1 S 5-17-51	--	7.1	989	--	--	--	--	0	242 3.97	--	138 3.89	66 1.06	--	--	--		292
16S/ 1W-12R 2 S 5-17-51	--	7.5	922	41 2.05 23	39 3.21 36	83 3.61 41	--	0	227 3.72 42	46 0.96 11	118 3.33 38	53 0.85 10	--	0	--	700 492	263
16S/ 1W-12R 3 S 6-19-51	--	7.6	1790	94 4.69 26	66 5.43 30	174 7.57 42	8 0.20 1	0	170 2.79 16	46 0.96 6	425 11.99 69	100 1.61 9	0.3	0.49	50	1050 1047	506
16S/ 1W-13A 2 S 9-21-51	--	7.3	2538	139 6.94 29	95 7.81 32	216 9.39 39	--	0	134 2.20 9	50 1.04 4	740 20.87 84	47.2 0.76 3	--	0.14	--	2156 1353	738
16S/ 1W-13M 1 S 2- 9-51	--	--	--	58 2.89 27	37 3.04 29	106 4.61 44	--	0	287 4.70 44	97 2.02 19	128 3.61 34	16 0.26 2	--	--	26	625 609	297
16S/ 1W-14A 1 S 5-16-51	--	7.5	1690	80 3.99 23	59 4.85 29	188 8.17 48	--	0	429 7.03 40	108 2.25 13	280 7.90 45	14 0.23 1	--	0.05	--	969 940	442
16S/ 1W-14B 3 S 5-15-51	--	--	1798	--	--	--	--	0	320 5.24	--	325 9.17	143 2.31	--	--	--		
16S/ 1W-14C 1 S 5-15-51	--	7.1	15385	384 19.16 11	174 14.31 8	3174 138.01 80	--	0	168 2.75 2	84 1.75 1	6020 169.76 97	21 0.34	--	0.06	--	11344 9940	1675
16S/ 1W-14C 2 S 5-15-51	--	--	2045	--	--	--	--	0	293 4.80	--	425 11.99	112 1.81	--	--	--		
16S/ 1W-14C 3 S 5-10-51	--	7.6	1445	63 3.14 22	45 3.70 26	165 7.17 51	--	0	234 3.84 27	41 0.85 6	295 8.32 59	73 1.18 8	--	0.02	--	834 797	342
16S/ 1W-14C 5 S 5-14-51	--	--	1499	--	--	--	--	0	229 3.75	--	305 8.60	93 1.50	--	--	--		
16S/ 1W-14C 7 S 5-14-51	--	7.3	2619	114 5.69 23	85 6.99 28	280 12.17 49	--	0	351 5.75 22	154 3.21 13	550 15.51 60	73 1.18 5	--	0.04	--	1571 1429	635
16S/ 1W-14F 1 S 5-14-51	--	7.5	1212	--	--	--	--	0	349 5.72	--	152 4.29	45 0.73	--	--	--		276
16S/ 1W-14F 2 S 5-14-51	--	8.4	1176	42 2.10 19	32 2.63 24	148 6.44 58	--	19 0.63 6	229 3.75 34	51 1.06 10	161 4.54 42	58 0.94 9	--	0.08	--	725 624	237
16S/ 1W-14H 1 S 5-16-51	--	--	1645	--	--	--	--	0	390 6.39	--	260 7.33	54 0.87	--	--	--		
16S/ 1W-14H 3 S 5-15-51	--	8.1	1934	--	--	--	--	0	454 7.44	--	370 10.43	46 0.74	--	--	--		580
16S/ 1W-14L 1 S 5-15-51	--	7.3	733	34 1.70 20	36 2.96 35	89 3.87 45	--	0	271 4.44 52	41 0.85 10	98 2.76 33	26 0.42 5	--	0.04	--	534 457	233
16S/ 1W-14M 1 S 5-16-51	--	7.2	2342	126 6.29 25	92 7.57 30	260 11.30 45	--	0	464 7.60 30	307 6.39 25	400 11.28 44	17 0.27 1	--	0.13	--	1639 1430	694
16S/ 1W-14M 3 S 5-10-51	--	--	1093	--	--	--	--	0	266 4.36	--	180 5.08	24 0.39	--	--	--		
16S/ 1W-14M 5 S 5- 9-51	--	7.7	1185	45 2.25 20	32 2.63 23	151 6.57 57	--	0	278 4.56 38	54 1.12 9	210 5.92 49	26 0.42 3	--	0.06	--	702 655	244
16S/ 1W-14NS1 S 5-16-51	--	7.0	2110	110 5.49 26	78 6.41 31	207 9.00 43	--	0	439 7.20 36	168 3.50 18	325 9.17 46	1.9 0.03	--	0.02	--	1317 1106	595
16S/ 1W-15G 1 S 5- 8-51	--	7.9	3474	119 5.94 18	79 6.50 20	463 20.13 62	--	0	324 5.31 16	84 1.75 5	920 25.94 78	8.7 0.14	--	0.05	--	2096 1833	622
16S/ 1W-15J 2 S 5- 9-51	--	6.3	1027	44 2.20 22	27 2.22 22	130 5.65 56	--	0	278 4.56 44	70 1.46 14	121 3.41 33	63 1.02 10	--	0	--	622 592	221

State well number Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C Evap 105°C Computed	Total hardness as $CaCO_3$

SAN DIEGO HYDRO UNIT Z0700

LOWER SAN DIEGO HYDRO SUBUNIT Z07A0

State well number Date sampled	Temp.	pH	Spec. cond.	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F	B	SiO_2	TDS	Total hardness
16S/ 1W-15K 2 S 4-19-62	--	7.7	6400	140 6.99 9	137 11.27 15	1310 56.96 76	7 0.18	0	968 15.87 22	978 20.36 28	1261 35.56 49	10 0.16	1.0	0.72	50	 4424 4371	914
16S/ 1W-15K 3 S 8- 2-56	71	7.8	6140	174 8.68 14	115 9.46 15	989 43.00 70	2 0.05	0	525 8.60 14	252 5.25 9	1670 47.09 77	32.4 0.52 1	0.7	0.35	--	 3716 3494	908
16S/ 1W-15K 4 S 5- 8-51	--	8.5	2290	86 4.29 18	68 5.59 23	325 14.13 59	1 0.03	26 0.87 4	422 6.92 30	46 0.96 4	508 14.33 62	7.4 0.12 1	0.4	0.34	35	1310 1311	494
16S/ 1W-15K 5 S 5- 8-51	--	7.9	1385	81 4.04 30	30 2.47 18	162 7.04 52	--	0	264 4.33 33	59 1.23 10	256 7.22 56	10 0.16 1	--	0.10	--	 777 728	326
16S/ 1W-15K 6 S 5- 8-51	--	8.1	1258	--	--	--	--	0	303 4.97	--	243 6.85	10 0.16	--	--	--		328
16S/ 1W-15K 7 S 5- 9-51	--	--	1458	--	--	--	--	0	329 5.39	--	305 8.60	13 0.21	--	--	--		
16S/ 1W-15K 8 S 11- 6-63	--	7.6	2600	148 7.39 23	75 6.17 20	415 18.04 57	1 0.03	0	573 9.39 30	394 8.20 26	496 13.99 44	10 0.16 1	0.4	0.45	53	1816 1875	679
16S/ 1W-15P 1 S 5- 9-51	--	7.8	770	66 3.29 38	18 1.48 17	89 3.87 45	1 0.03	0	336 5.51 66	89 1.85 22	20 0.56 7	28 0.45 5	2.0	0.19	20	499 498	239
16S/ 1W-15R 1 S 5- 9-51	--	7.3	1180	64 3.19 25	52 4.28 34	118 5.13 40	3 0.08 1	0	269 4.74 39	151 3.14 26	144 4.06 33	20 0.32 3	0.1	0.10	60	755 754	374
16S/ 1W-23E 1 S 10-11-51	--	7.5	1608	61 3.04 18	65 5.35 32	196 8.52 50	--	0	332 5.44 32	217 4.52 27	235 6.63 39	23 0.37 2	--	0.19	--	 1056 960	420
16S/ 2W- 2D 1 S 4- 8-59	--	7.8	2779	68 3.39 12	62 5.10 18	439 19.09 69	5 0.13	0	315 5.16 19	107 2.23 8	693 19.54 72	3 0.05	1.5	0.18	30	1826 1563	425
16S/ 2W- 3L 1 S 6- 1-60	74	7.4	2581	119 5.94 22	75 6.17 23	331 14.39 54	10 0.26 1	0	307 5.03 19	262 5.45 21	570 16.07 60	2 0.03	0.6	0.62	19	1740 1540	606
16S/ 2W- 3P 1 S 2-24-60	--	7.3	3090	196 9.78 31	88 7.24 23	336 14.61 46	2 0.05	0	439 7.20 23	235 4.89 16	679 19.15 61	16 0.26 1	0.7	0.15	38	1811 1807	852
16S/ 2W- 4Q 1 S 10-28-58	--	7.3	2380	160 7.98 34	51 4.19 18	250 10.87 47	4 0.10	--	423 6.93 30	210 4.37 19	412 11.62 50	11 0.18 1	0.5	--	32	 1338	609
16S/ 2W- 5D 1 S 2-17-59	--	7.3	1400	149 7.44 46	35 2.88 18	13 5.74 36	2 0.05	0	250 4.10 25	288 6.00 37	216 6.09 37	7.6 0.12 1	0.3	0.13	35	1039 988	516
16S/ 2W- 5M 1 S 5-31-60	76	7.5	1406	54 2.69 19	28 2.30 16	214 9.30 64	8 0.20 1	0	346 5.67 41	111 2.31 17	206 5.81 42	0	0.2	0.40	9	975 801	250
16S/ 2W- 5N 1 S 4- 8-59	--	7.6	1432	51 2.54 18	20 1.64 11	230 10.00 70	4 0.10 1	0	315 5.16 36	118 2.46 17	241 6.80 47	0	0.5	0.08	22	994 841	209
16S/ 2W- 9B 1 S 10-31-63	--	7.6	2350	26 1.30 7	54 4.44 23	310 13.48 70	2 0.05	0	436 7.15 26	287 5.98 22	511 14.41 52	14 0.23 1	0.2	0.26	33	1494 1452	267
16S/ 2W- 9C 4 S 7-25-61	--	8.0	2970	242 12.08 36	97 7.98 24	314 13.65 [illegible]	6 0.15	0	471 7.72 23	377 7.85 23	636 17.94 54	0	[illegible]	0.33	16	 2524 1924	1004
16S/ 2W- 9C 5 S 2-24-60	69	7.5	1610	120 5.99 29	57 4.69 23	228 9.91 48	5 0.13 1	0	276 4.56 22	220 4.58 22	399 11.25 55	3.7 0.06	0.8	0.18	23	1192 1193	534
16S/ 2W- 9C 6 S 8-11-58	--	7.3	1700	96 4.79 33	39 3.21 22	151 6.57 45	--	0	254 4.16 29	70 1.46 10	316 8.91 61	0	0.4	0.20	24	 821	400
16S/ 2W- 9C 7 S 8-11-58	--	7.5	1625	78 3.89	38 3.13	157 6.83	--	0	374 6.13	70 1.46	220 6.20	--	0.7	0.10	24		351
16S/ 2W- 9F 1 S 6- 1-60	71	7.1	2800	162 8.08 29	59 4.85 17	347 15.09 54	7 0.18 1	0	581 9.52 33	171 3.56 12	554 15.62 54	7 0.11	0.3	0.60	19	1920 1613	647

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				

SAN DIEGO HYDRO UNIT 20700

LOWER SAN DIEGO HYDRO SUBUNIT 207A0

16S/ 2W- 9L 1 S	--	7.2	3150	240	91	320	1	0	366	296	743	0.9	0.2	0	36		974
5-22-57				11.98	7.48	13.91	0.03		6.00	6.16	20.95	0.01				2208	
				36	22	42			18	19	63					1908	
16S/ 2W- 9N 1 S	--	8.1	957	70	25	90	4	0	105	273	80	1	0.5	0	10	668	278
4- 9-59				3.49	2.06	3.91	0.10		1.72	5.68	2.26	0.02					
				37	22	41	1		18	59	23					605	
16S/ 2W-16C 1 S	80	7.5	3906	359	122	280	5	0	188	112	1200	36	0.4	0.03	40		1398
7-27-54				17.91	10.03	12.17	0.13		3.08	2.33	33.84	0.58				2657	
				45	25	30			8	6	85	1				2247	
16S/ 2W-16D 3 S	78	7.2	1761	125	34	178	2	0	317	144	317	0	0.1	0.06	21	1175	452
6- 1-60				6.24	2.80	7.74	0.05		5.20	3.00	8.94						
				37	17	46			30	18	52					977	
16S/ 2W-16E 5 S	71	7.7	1740	204	29	176	4	0	375	132	404	1.5	0.2	0.06	35	1324	629
2-18-59				10.18	2.38	7.65	0.10		6.15	2.75	11.39	0.02					
				50	12	38			30	14	56					1170	
16S/ 2W-16G 1 S	--	6.7	2060	124	72	210	--	0	220	130	530	0.0	0.1	0.30	20		606
6-28-51				6.19	5.92	9.13			3.61	2.71	14.95						
				29	28	43			17	13	70					1195	
16S/ 2W-16M 2 S	74	7.8	962	62	26	88	4	0	89	265	88	1	0.3	0.04	6	650	262
6- 1-60				3.09	2.14	3.83	0.10		1.46	5.52	2.48	0.02					
				34	23	42	1		15	58	26					584	
16S/ 2W-17D 1 S	74	7.2	3160	226	68	363	5	0	432	383	615	9	0.3	0.60	11	2155	844
5-31-60				11.28	5.59	15.78	0.13		7.08	7.97	17.34	0.15					
				34	17	48			22	24	53					1893	
16S/ 2W-17D 2 S	--	7.1	--	189	93	--	--	--	--	360	593	2.0	0.8	--	--	1776	855
2- 6-63				9.43	7.65					7.50	16.72	0.03					
16S/ 2W-17H 1 S	--	7.9	2800	210	66	330	3	0	373	200	702	6.5	0.1	0.29	23	1976	796
10-31-63				10.48	5.43	14.35	0.08		6.11	4.16	19.80	0.10					
				35	18	47			20	14	66					1724	
16S/ 2W-17H 2 S	--	7.3	1060	51	23	103	12	--	140	142	139	0.0	0.4	--	16	560	222
7-17-57				2.54	1.89	4.48	0.31		2.29	2.96	3.92						
				28	20	49	3		25	32	43					557	
16S/ 2W-17L 1 S	76	8.0	1380	46	27	240	4	0	336	120	247	0	0.8	0.46	19	854	226
10-31-63				2.30	2.22	10.44	0.10		5.51	2.50	6.97						
				15	15	69	1		37	17	47					869	
16S/ 2W-18M 1 S	--	7.5	1560	48	17	255	4	--	311	91	282	0.0	1.2	--	20	860	190
5-12-58				2.40	1.40	11.09	0.10		5.10	1.89	7.95						
				16	9	74	1		34	13	53					871	
16S/ 2W-18N 1 S	--	7.8	2931	122	115	340	5	0	416	154	703	4	0.7	0.44	50	1944	778
4- 9-59				6.09	9.46	14.78	0.13		6.82	3.21	19.82	0.06					
				20	31	49			23	11	66					1699	
16S/ 2W-18D 3 S	68	7.2	1786	103	46	215	4	0	303	146	368	2.5	0.6	0.14	--		446
4-22-55				5.14	3.78	9.35	0.10		4.97	3.04	10.38	0.04				1105	
				28	21	51	1		27	16	56					1034	
16S/ 3W-13Q 1 S	--	7.3	2440	125	71	370	3	0	369	262	579	0	0.2	0.28	21	1702	604
10-31-63				6.24	5.84	16.09	0.08		6.05	5.45	16.33						
				22	21	57			22	20	59					1613	
16S/ 3W-13R 1 S	71	7.7	1484	105	41	170	3	--	242	192	290	4.0	0.4	0.12	25	965	431
9-11-58				5.24	3.37	7.39	0.08		3.97	4.00	8.18	0.06					
				33	21	46			24	25	50					949	
16S/ 3W-21J 1 S	--	7.6	3580	178	100	500	14	0	408	324	911	1.7	0.2	0.36	20	2432	856
10-31-63				8.88	8.22	21.74	0.36		6.69	6.75	25.69	0.03					
				23	21	55	1		17	17	66					2250	
16S/ 3W-21R 1 S	71	7.0	1934	148	76	168	8	--	334	128	450	5.5	0.4	0.10	30	1375	683
9-10-58				7.39	6.25	7.30	0.20		5.47	2.66	12.69	0.09					
				35	30	35	1		26	13	61					1178	
16S/ 3W-21R 4 S	70	7.3	5818	290	170	653	16	0	434	411	1526	0	0.2	0.08	19	3650	1424
5-31-60				14.47	13.98	28.39	0.41		7.11	8.56	43.03						
				25	24	50	1		12	15	73					3299	
16S/ 3W-22G 1 S	--	7.3	3750	248	100	560	4	0	443	567	706	32	0.4	0.43	20	2710	1031
10-31-63				12.38	8.22	24.35	0.10		7.26	11.80	19.91	0.52					
				27	18	54			18	30	50	1				2456	
16S/ 3W-22H 3 S	70	7.6	4357	39	36	858	13	--	229	228	1190	5	0.8	1.30	10	2448	246
4- 9-59				1.95	2.96	37.31	0.33		3.75	4.75	33.56	0.08					
				5	7	88	1		9	11	80					2494	
16S/ 3W-22H 4 S	--	7.3	3663	211	126	442	6	--	390	448	825	43	0.5	0.45	25	2463	1045
4- 9-59				10.53	10.36	19.22	0.15		6.39	9.33	23.27	0.69					
				26	26	48			16	24	59	2				2319	

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C Evap 105°C Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million, equivalents per million, percent reactance value									Chemical constituents in parts per million				
SAN DIEGO HYDRO UNIT 20700																	
LOWER SAN DIEGO HYDRO SUBUNIT 207A0																	
16S/ 3W-22J 1 S	68	7.7	3320	204	113	361	8	0	397	391	691	2.5	0.7	0.06	30	2051	974
2-23-60				10.18	9.29	15.70	0.20		6.51	8.14	19.49	0.04					
				29	26	44	1		19	24	57					1996	
16S/ 3W-22K 2 S	68	7.2	3237	203	98	371	9	0	383	388	717	1	0.1	0.08	23	2241	910
4- 9-59				10.13	8.06	16.13	0.23		6.28	8.08	20.22	0.02					
				29	23	47	1		18	23	56					1998	
16S/ 3W-22P 1 S	79	7.3	1087	76	24	98	4	0	221	92	164	0	0.2	0	13	690	288
5-31-60				3.79	1.97	4.26	0.10		3.62	1.92	4.62						
				37	19	42	1		36	19	45					580	
16S/ 3W-23A 1 S	68	7.3	4930	330	160	563	2	0	436	583	1167	16	0.8	0.12	28	3213	1483
2-23-60				16.47	13.16	24.48	0.05		7.15	12.14	32.91	0.26					
				30	24	45			14	23	63					3064	
16S/ 3W-23A 2 S	76	6.9	1674	103	46	173	7	0	151	292	282	0	0.3	0.22	5	1115	446
5-31-60				5.14	3.78	7.52	0.18		2.47	6.08	7.95						
				31	23	45	1		15	37	48					983	
16S/ 3W-23E 5 S	68	7.0	1320	87	36	131	3	0	268	123	209	3.0	0.4	0.02	30	787	365
2-23-60				4.34	2.96	5.70	0.08		4.39	2.56	5.89	0.05					
				33	23	44	1		34	20	46					754	
16S/ 3W-23K 1 S	73	7.7	2114	64	23	339	9	0	278	158	456	0	0.7	0.70	23	1400	254
2-25-60				3.19	1.89	14.74	0.23		4.56	3.29	12.86						
				16	9	74	1		22	16	62					1210	
16S/ 3W-23K 2 S	--	7.9	3370	205	97	460	3	0	480	372	801	0	0.1	0.43	22		911
7-25-61				10.23	7.98	20.00	0.08		7.87	7.75	22.59					2472	
				27	21	52			21	20	59					2197	
16S/ 3W-23M 1 S	72	7.6	3817	271	120	440	6	0	495	427	910	2.5	0.6	0.22	25		1170
7-22-54				13.52	9.87	19.13	0.15		8.11	8.89	25.66	0.04				2638	
				32	23	45			19	21	60					2446	
16S/ 3W-23N 1 S	68	7.4	2800	198	67	320	5	0	481	279	502	17	0.3	0.20	26	1775	770
9-11-58				9.88	5.51	13.91	0.13		7.88	5.81	14.16	0.27					
				34	19	47			28	21	50	1				1651	
16S/ 3W-24F 1 S	--	6.6	2605	155	66	304	7	0	127	437	525	0	0.1	0.10	10	1725	659
5-31-60				7.73	5.43	13.22	0.18		2.08	9.10	14.81						
				29	20	50	1		8	35	57					1567	
SAN VICENTE HYDRO SUBUNIT 207B0																	
13S/ 2E-30E 1 S	76	8.2	588	43	20	49	3	0	171	22	84	14	0.1	0	25	409	190
9-21-59				2.15	1.64	2.13	0.08		2.80	0.46	2.37	0.23					
				36	27	36	1		48	8	40	4				344	
14S/ 1E-23F 1 S	73	7.3	783	52	29	58	3	0	178	29	120	43	0.1	0	36	530	249
9-22-59				2.59	2.38	2.52	0.08		2.92	0.60	3.38	0.69					
				34	31	33	1		38	8	45	9				458	
14S/ 1E-23P 1 S	--	7.1	943	40	20	119	1	0	237	41	145	14.9	0.6	0	--		182
7-29-53				2.00	1.64	5.17	0.03		3.88	0.85	4.09	0.24				497	
				23	19	58			43	9	45	3				498	
14S/ 2E- 4D 1 S	66	7.1	696	41	28	53	3	0	142	35	83	75	0.1	0.10	45	473	218
9-21-59				2.05	2.30	2.30	0.08		2.33	0.73	2.34	1.21					
				30	34	34	1		35	11	35	18				433	
EL CAPITAN HYDROLOGIC SUBUNIT 207C0																	
15S/ 2E-27L 1 S	70	7.0	1366	118	53	100	7	0	425	81	221	13.6	0.3	0.16	59	920	513
3-18-64				5.89	4.36	4.35	0.18		6.97	1.69	6.23	0.22					
				40	29	29	1		46	11	41	1				862	
15S/ 2E-28L 1 S	64	7.7	1253	82	47	74	2	0	253	47	203	30.4	0.2	0	48	795	398
5-14-58				4.09	3.87	3.22	0.05		4.15	0.98	5.72	0.49					
				36	34	29			37	9	50	4				658	
CUYAMACA HYDRO SUBUNIT 207D0																	
12S/ 3E-35C 1 S	68	7.5	360	30	12	28	3	0	117	41	27	4.5	0.3	0	27	205	125
5-26-64				1.50	0.99	1.22	0.08		1.92	0.85	0.76	0.07					
				40	26	32	2		53	24	21	2				230	
12S/ 3E-35P 1 S	62	7.5	525	42	21	31	4	0	144	31	46	56	0.3	0	25	290	192
5-26-64				2.10	1.73	1.35	0.10		2.36	0.65	1.30	0.90					
				40	33	26	2		45	12	25	17				327	
12S/ 3E-35P 2 S	65	6.4	366	17	16	31	2	0	85	25	57	0.5	0.5	0	45	240	109
5-26-64				0.85	1.32	1.35	0.05		1.39	0.52	1.61	0.01					
				24	37	38	1		39	15	46					236	
13S/ 3E-13J 1 S	60	7.2	810	62	68	21	1	0	288	144	53	7.2	0.3	0	50	570	434
5-26-64				3.09	5.59	0.91	0.03		4.72	3.00	1.49	0.12					
				32	58	9			51	32	16	1				548	

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
				SAN DIEGO HYDRO UNIT Z0700													
CUYAMACA HYDRO SUBUNIT Z0700																	
13S/ 4E-21K 1 S	58	6.8	417	29	20	28	5	0	159	38	31	0.0	0.3	0	35	220	155
5-26-64				1.45	1.64	1.22	0.13		2.61	0.79	0.87						
				33	37	27	3		61	19	20					264	
14S/ 4E- 4M 1 S	68	7.8	267	22	10	15	1	0	83	22	17	18	0.2	0.01	60	195	96
5-26-64				1.10	0.82	0.65	0.03		1.36	0.46	0.48	0.29					
				42	32	25	1		53	18	19	11				206	
14S/ 4E- 9QS1 S	51	7.1	240	20	16	6	0	0	128	3	21	0	0.1	0.06	29	154	116
5-14-58				1.00	1.32	0.35			2.10	0.06	0.59						
				37	49	13			76	2	21					160	
14S/ 4E- 9E 1 S	58	7.1	315	30	9	14	4	0	146	0	23	0	0.2	0	42	208	112
6-12-57				1.50	0.74	0.61	0.10		2.39		0.65						
				51	25	21	3		79		21					194	
				CORONADO HYDRO UNIT Z0800													
SAN DIEGO MESA HYDRO SUBUNIT Z0880																	
17S/ 2W- 4B 1 S	78	7.4	957	86	19	102	4	0	383	28	123	1.5	0.4	0.12	40		293
7-22-54				4.29	1.56	4.43	0.10		6.28	0.58	3.47	0.02				590	
				41	15	43	1		61	6	34					592	
17S/ 2W- 8J 1 S	--	7.5	764	61	12	77	3	0	251	10	100	0	0.1	0.14	19	524	202
8-14-59				3.04	0.99	3.35	0.08		4.11	0.21	2.82						
				41	13	45	1		58	3	39					406	
PARADISE HYDRO SUBUNIT Z08C0																	
17S/ 2W-15Q 1 S	--	--	--	--	--	--	--	--	--	--	357	--	--	--	--		
10-31-51											10.07						
17S/ 2W-15J 1 S	79	7.4	1170	40	17	210	4	0	449	52	139	19.4	0.8	0.30	25		170
7-21-54				2.00	1.40	9.13	0.10		7.36	1.08	3.92	0.31				730	
				16	11	72	1		58	9	31	2				728	
17S/ 2W-16Q 1 S	--	8.2	--	42	23	161	3	--	220	71	185	0.0	0.3	--	--	653	200
8-15-60				2.10	1.89	7.00	0.08		3.61	1.48	5.22						
				19	17	63	1		35	14	51					593	
17S/ 2W-16Q 2 S	--	8.1	--	36	19	138	3	--	192	62	159	0.0	0.3	--	--	575	168
8-15-60				1.80	1.56	6.00	0.08		3.15	1.29	4.48						
				19	17	64	1		35	14	50					512	
				SWEETWATER HYDRO UNIT Z0900													
LOWER SWEETWATER HYDRO SUBUNIT Z09A0																	
17S/ 1W-19K 1 S	68	2.2	7685	250	106	432	16	0	0	335	1560	38.5	0.2	0	24	5216	1061
7-19-57				12.48	8.72	18.78	0.41			6.97	43.99	0.62					
				31	22	46	1			14	85	1				2762	
17S/ 1W-19K 2 S	66	7.9	3650	244	109	404	4	0	296	350	979	45	0.1	0.39	30	2598	1058
5-12-58				12.18	8.96	17.57	0.10		4.85	7.29	27.61	0.73					
				31	23	45			12	18	68	2				2311	
17S/ 1W-20H 1 S	69	7.3	3306	203	76	368	3	--	335	120	865	13.6	0.5	0.20	25	2302	820
5-12-58				10.13	6.25	16.00	0.08		5.49	2.50	24.39	0.22					
				31	19	49			17	8	75	1				1839	
17S/ 1W-20M 1 S	68	7.9	4545	245	108	587	4	0	319	427	1170	0	0.9	0.49	36	3021	1056
7-15-59				12.23	8.88	25.52	0.10		5.23	8.89	32.99						
				26	19	55			11	19	70					2735	
17S/ 1W-30E 1 S	--	8.1	2049	102	66	220	3	0	256	167	415	46.1	0.4	0.08	--		526
9-26-53				5.09	5.43	9.57	0.08		4.20	3.48	11.70	0.74				1314	
				25	27	47			21	17	58	4				1145	
17S/ 1W-30E 2 S	--	7.6	3320	218	86	329	4	0	275	278	821	16	0.2	0.16	24	2370	898
7-15-59				10.88	7.07	14.30	0.10		4.51	5.79	23.15	0.26					
				34	22	44			13	17	69	1				1912	
17S/ 2W-25P 4 S	72	7.4	2737	172	68	307	4	0	385	254	577	0	0.3	0.19	16	1863	709
7-22-58				8.58	5.59	13.35	0.10		6.31	5.29	16.27						
				31	20	48			23	19	58					1588	
17S/ 2W-27E 1 S	--	8.1	1318	74	39	151	7	0	140	340	149	5.4	0.2	0	8	908	345
7-19-57				3.69	3.21	6.57	0.18		2.29	7.08	4.20	0.09					
				27	24	48	1		17	52	31	1				842	
17S/ 2W-27R 1 S	70	7.6	3900	239	127	429	2	0	379	288	996	0	0.3	0.33	23		1119
4-13-62				11.93	10.44	18.65	0.05		6.21	6.00	28.09					2404	
				29	25	45			15	15	70					2291	
17S/ 2W-28R 1 S	72	7.9	3980	118	120	538	8	0	448	233	954	5.2	0.7	0.27	26	2250	789
8-19-60				5.89	9.87	23.39	0.20		7.34	4.85	26.90	0.08					
				15	25	59	1		19	12	69					2223	

State well number Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C Evap 105°C Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
SWEETWATER HYDRO UNIT 20900																	
LOWER SWEETWATER HYDRO SUBUNIT 209A0																	
17S/ 2W-33B 1 S 11- 5-63	--	8.0	2810	110 5.49 18	49 4.03 13	485 21.09 68	15 0.38 1	0	329 5.39 16	139 2.89 9	791 22.31 73	0	0.2	0.40	22	1820 1773	476
17S/ 2W-36D 1 S 11- 5-63	--	7.9	3450	279 13.92 34	83 6.83 16	475 20.65 50	2 0.05	0	477 7.82 19	327 6.81 17	940 26.51 64	0	0.2	0.30	17	2660 2358	1038
MIDDLE SWEETWATER HYDRO SUBUNIT 209B0																	
15S/ 2E-30P 1 S 2-25-60	70	7.0	820	43 2.15 25	32 2.63 31	84 3.65 43	2 0.05 1	0	235 3.85 47	25 0.52 6	129 3.64 44	14 0.23 3	0.5	0.03	60	460 513	237
15S/ 2E-31D 1 S 8- 4-54	--	6.8	--	53 2.64 31	27 2.22 26	84 3.65 42	3 0.08 1	0	102 1.67 21	165 3.44 43	100 2.82 36	0.4 0.01	0.3	--	--	 555 483	243
15S/ 2E-31D 2 S 4- 6-54	--	7.4	--	69 3.44 36	25 2.06 21	94 4.09 42	4 0.10 1	0	194 3.18 36	77 1.60 18	146 4.12 46	2.0 0.03	0.6	--	--	 655 513	275
15S/ 2E-31D 3 S 5- 6-59	--	8.5	--	31 1.55 22	25 2.06 30	75 3.26 47	4 0.10 1	14 0.47 7	140 2.29 36	41 0.85 13	98 2.76 43	0.9 0.01	0.6	--	--	 495 358	181
15S/ 2E-34N 1 S 6-17-58	78	7.4	824	63 3.14 40	27 2.22 28	56 2.43 31	4 0.10 1	0	201 3.29 42	16 0.33 4	149 4.20 53	4 0.06 1	0.1	0.40	42	568 460	268
16S/ 1E-11J 1 S 6-19-58	71	7.2	931	51 2.54 29	25 2.06 23	98 4.26 48	2 0.05 1	0	183 3.00 34	71 1.48 17	150 4.23 48	8.7 0.14 2	0.9	0.40	27	589 524	230
16S/ 1E-12D 2 S 6-25-58	73	7.2	873	36 1.80 21	23 1.89 22	108 4.70 55	3 0.08 1	0	209 3.43 41	24 0.50 6	157 4.43 53	2.0 0.03	0.5	0.30	29	567 486	165
16S/ 1E-14G 1 S 5-12-58	72	7.1	1066	76 3.79 37	29 2.38 23	93 4.04 39	3 0.08 1	--	244 4.00 39	39 0.81 8	180 5.08 49	25.5 0.41 4	0.5	0	50	667 616	309
16S/ 1E-16L 1 S 6-25-58	67	7.9	558	41 2.05 37	16 1.32 24	48 2.09 38	1 0.03 1	0	168 2.75 51	45 0.94 17	60 1.69 31	0	0.2	0.50	33	386 327	169
16S/ 1E-19K 1 S 6-19-58	72	7.4	984	55 2.74 28	33 2.71 28	94 4.09 43	3 0.08 1	0	293 4.80 49	33 0.69 7	152 4.29 44	4.3 0.07 1	0.2	0.75	40	648 559	273
16S/ 1E-29F 1 S 6-19-58	68	7.4	882	59 2.94 33	24 1.97 22	88 3.83 44	2 0.05 1	0	195 3.20 37	99 2.06 24	124 3.50 40	0	0.2	0.50	38	591 531	246
16S/ 1E-31B 1 S 9-12-58	68	7.2	1275	102 5.09 36	56 4.61 33	99 4.30 31	3 0.08 1	0	244 4.00 29	253 5.27 38	160 4.51 33	2.4 0.04	0.2	0.39	16	814 812	485
16S/ 1E-31C 1 S 8-27-54	--	7.6	1231	99 4.94 35	46 3.78 27	120 5.22 37	2 0.05	0	344 5.64 41	166 3.46 25	167 4.71 34	1.0 0.02	0.4	0.06	--	 845 771	436
16S/ 2E- 6N 2 S 6-25-58	72	7.2	806	41 2.05 27	22 1.81 24	83 3.61 48	3 0.08 1	0	189 3.10 41	26 0.54 7	131 3.69 49	8.7 0.14 2	0.4	0.40	39	512 447	193
16S/ 2E-28H 1 S 4-30-64	--	7.7	660	56 2.79 40	15 1.23 18	65 2.83 41	3 0.08 1	0	217 3.56 51	51 1.06 15	84 2.37 34	0.9 0.01	0.4	0.16	47	408 429	201
16S/ 2E-32D 1 S 4-30-64	--	6.9	633	33 1.65 26	14 1.15 18	78 3.39 54	2 0.05 1	0	176 2.88 45	28 0.58 9	104 2.93 46	1.2 0.02	0.4	0.05	46	379 393	140
17S/ 1E- 3F 1 S 4-18-62	--	7.4	904	50 2.50 29	29 2.38 28	84 3.65 43	1 0.03	0	220 3.61 42	35 0.73 8	145 4.09 48	10 0.16 2	0.6	0.10	54	502 517	244
17S/ 1E- 3N 1 S 3- 8-63	--	7.8	740	47 2.35 26	30 2.47 27	95 4.13 46	2 0.05 1	0	214 3.51 40	40 0.83 10	137 3.86 44	30 0.48 6	0.4	0	39	552 526	241
17S/ 1E- 4H 1 S 11- 6-63	--	7.5	2070	114 5.69 24	98 8.06 34	223 9.70 41	2 0.05	0	456 7.47 32	83 1.73 7	489 13.79 59	12 0.19 1	0.1	0.23	32	1566 1278	688
17S/ 1E- 4R 1 S 8-27-54	--	8.0	1098	71 3.54 29	44 3.62 30	112 4.87 40	2 0.05	0	320 5.24 43	47 0.98 8	175 4.94 40	71 1.15 9	0.5	0.22	--	 745 680	358

State well number Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million / equivalents per million / percent reactance value: Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Chemical constituents in parts per million: Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
SWEETWATER HYDRO UNIT 20900																	
UPPER SWEETWATER HYDRO SUBUNIT 20920																	
14S/ 4E-27G 1 S 5-26-64	60	7.8	323	33 1.65 50	6 0.49 15	26 1.13 34	2 0.05 2	0	132 2.16 66	25 0.52 16	21 0.59 18	1.0 0.02 1	0.8	0.04	34	210 214	107
14S/ 4E-33G 1 S 9- 4-59	--	6.6	277	37 1.85 49	11 0.90 24	23 1.00 26	1 0.03 1	0	124 2.03 54	40 0.83 22	32 0.90 24	0	0.2	0	30	260 235	138
15S/ 3E-20G 1 S 5- 8-58	63	7.2	464	34 1.70 36	16 1.32 28	37 1.61 34	2 0.05 1	--	189 3.10 65	16 0.33 7	45 1.27 27	3.5 0.06 1	0.4	0	40	286 287	151
15S/ 3E-26DS1 S 7-23-53	--	7.4	265	16 0.80	4 0.33	33 1.43	1 0.03	0	95 1.56	--	36 1.02	0.0	0.3	0.05	--	 204	57
15S/ 3E-29E 1 S 4-28-64	62	6.6	351	26 1.30 36	14 1.15 32	25 1.09 30	2 0.05 1	0	122 2.00 57	13 0.27 8	36 1.02 29	12.4 0.20 6	0.2	0	63	264 252	123
15S/ 4E- 9F 1 S 4-29-64	60	7.4	570	70 3.49 61	11 0.90 16	30 1.30 23	2 0.05 1	0	256 4.20 71	28 0.58 10	40 1.13 19	1.8 0.03 1	0.4	0	31	359 340	220
15S/ 4E- 9GS1 S 4-29-64	58	7.4	396	44 2.20 53	9 0.74 18	27 1.17 28	3 0.08 2	0	194 3.18 75	16 0.33 8	26 0.73 17	0.4 0.01	0.4	0.01	43	250 264	147
15S/ 4E-17N 1 S 5- 8-58	64	7.4	490	56 2.79 54	11 0.90 17	33 1.43 26	2 0.05 1	0	220 3.61 67	19 0.40 7	48 1.35 25	0	0.4	0.07	33	291 311	185
15S/ 4E-190 1 S 4-28-64	54	7.1	520	45 2.25 41	16 1.32 24	42 1.83 33	3 0.08 1	0	167 2.74 50	79 1.64 30	40 1.13 20	1.1 0.02	0.3	0.04	37	330 346	179
15S/ 4E-20M 1 S 1- 5-61	--	8.0	--	38 1.90 39	18 1.48 30	33 1.43 29	4 0.10 2	0	158 2.59 51	39 0.81 19	30 0.85 20	0.0	0.2	--	--	310 240	169
16S/ 3E- 9P 1 S 10-16-53	--	7.6	588	29 1.45 26	17 1.40 25	63 2.74 49	1 0.03 1	--	186 3.05 55	17 0.35 6	74 2.09 37	5.8 0.09 2	0.3	0.05	--	 352 299	143
16S/ 3E- 9R 1 S 5- 8-58	55	6.3	465	21 1.05 25	14 1.15 27	46 2.00 47	2 0.05 1	--	103 1.69 40	16 0.33 8	70 1.97 47	14.0 0.23 5	0.4	0	40	294 274	110
OTAY HYDRO SUBUNIT 21080																	
18S/ 1W-19C 1 S 7- 9-63	--	7.7	4290	236 11.78 20	27 2.22 4	1035 45.00 76	15 0.38 1	0	232 3.80 6	370 7.70 13	1649 46.50 79	34 0.55 1	0.6	0.49	15	3647 3496	701
18S/ 1W-190 1 S 7- 9-63	--	7.7	4250	244 12.18 20	147 12.09 20	846 36.78 60	11 0.28	0	268 4.39 7	431 8.97 15	1684 47.49 78	5.6 0.09	0.7	0.55	23	3778 3525	1214
18S/ 1W-19H 1 S 7- 9-63	75	7.6	3440	164 8.18 18	56 4.61 10	729 31.70 71	9 0.23 1	0	287 4.70 11	228 4.75 11	1230 34.69 78	9.3 0.15	0.5	0.42	15	2686 2582	640
18S/ 1W-20Q 1 S 7- 9-63	74	8.0	1620	59 2.94 18	5 0.41 2	307 13.35 79	4 0.10 1	0	146 2.39 14	83 1.73 10	449 12.66 75	3.7 0.06	0.8	0.43	16	1001 1000	168
18S/ 1W-21R 1 S 8-20-53	--	7.3	4440	297 14.82 36	7 0.58 1	600 26.09 63	5 0.13	0	124 2.03 5	199 4.14 10	1250 35.25 85	5.0 0.08	1.2	1.00	--	 2588 2426	771
18S/ 1W-290 3 S 10- 1-53	--	7.2	2070	48 2.40 12	4 0.33 2	400 17.39 86	--	--	27 0.44 2	102 2.12 11	605 17.06 87	1.3 0.02	3.6	1.30	--	 1229 1178	137
18S/ 2W-15J 2 S 3- 7-63	--	7.5	1260	62 3.09 25	36 2.96 24	148 6.44 51	1 0.03	0	232 3.80 30	57 1.19 9	275 7.76 61	0.0	0.1	0.18	31	736 724	303
18S/ 2W-15M 1 S 9-12-63	70	8.2	1470	108 5.39 36	38 3.13 21	146 6.35 42	3 0.08 1	0	177 2.90 20	89 1.85 13	353 9.95 67	3.1 0.05	0.2	0.14	24	1138 851	426
18S/ 2W-15R 1 S 9-12-63	69	8.0	1270	59 2.94 26	30 2.47 22	132 5.74 51	2 0.05	0	211 3.46 30	44 0.92 8	248 6.99 61	1.9 0.03	0.4	0.12	35	714 656	271
18S/ 2W-21A 1 S 8-22-63	--	7.7	1650	112 5.59 35	23 1.89 12	190 8.26 52	4 0.10 1	0	78 1.28 8	58 1.21 8	468 13.20 84	0	0.1	0.26	13	1146 907	374

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
						OTAY HYORD UNIT					21000						
OTAY HYORO SUBUNIT				21080													
185/ 2W-21A 2 S	--	7.2	3800	266	118	360	6	0	104	134	1201	4.2	0.1	0.26	26	2166	1149
8-21-63				13.27	9.70	15.65	0.15		1.70	2.79	33.87	0.07					
				34	25	40			4	7	66					2167	
185/ 2W-21H 1 S	82	8.0	2150	148	64	230	4	0	146	99	644	2.5	0.2	0.07	13	1606	633
7-10-63				7.39	5.26	10.00	0.10		2.39	2.06	18.16	0.04					
				32	23	44			11	9	80					1276	
18S/ 2W-21J 1 S	--	7.8	2650	182	64	295	3	0	122	94	837	0	0.1	0.27	16	1664	718
5-13-64				9.08	5.26	12.83	0.08		2.00	1.96	23.60						
				33	19	47			7	7	66					1551	
185/ 2W-21J 2 S	--	7.5	1855	124	38	241	1	0	217	127	443	70	0.5	0.08	23	1292	466
7-10-63				6.19	3.13	10.48	0.03		3.56	2.64	12.49	1.13					
				31	16	53			18	13	63	6				1174	
185/ 2W-21K 1 S	69	7.2	1942	120	58	205	2	0	254	52	500	1.5	0.5	0.18	--		538
7-13-54				5.99	4.77	8.91	0.05		4.16	1.08	14.10	0.02				1445	
				30	24	45			21	6	73					1064	
185/ 2W-21L 1 S	--	7.9	2551	164	63	243	5	0	154	111	672	1.0	0.5	0.20	--	1660	669
6-23-64				8.18	5.18	10.57	0.13		2.52	2.31	18.95	0.02					
				34	22	44	1		11	10	80					1335	
18S/ 2W-21Q 1 S	69	7.2	2461	130	74	300	1	0	281	122	625	30	0.6	0.22	--		630
7-13-54				6.49	6.09	13.04	0.03		4.61	2.54	17.63	0.48				1780	
				25	24	51			18	10	70	2				1421	
18S/ 2W-22D 1 S	--	7.7	1330	97	30	135	4	0	162	93	298	0	0.1	0.18	18	936	366
8-21-63				4.84	2.47	5.87	0.10		2.66	1.94	8.40						
				36	19	44	1		20	15	65					755	
185/ 2W-22F 2 S	--	7.9	2790	200	99	375	2	0	256	217	862	111	0.5	0.11	25	2272	907
7-10-63				9.98	8.14	16.31	0.05		4.20	4.52	24.31	1.79					
				29	24	47			12	13	70	5				2017	
185/ 2W-22H 1 S	71	7.0	1580	96	49	183	2	0	172	65	431	10	0.1	0.17	34	1057	441
11- 1-63				4.79	4.03	7.96	0.05		2.82	1.35	12.15	0.16					
				28	24	47			17	8	74	1				955	
185/ 2W-22H 2 S	71	7.9	987	82	28	92	4	0	137	281	89	1.9	0.5	0.12	10	320	320
9-10-63				4.09	2.30	4.00	0.10		2.25	5.85	2.51	0.03					
				39	22	38	1		21	55	24					656	
18S/ 2W-22L 1 S	67	8.0	1030	67	25	104	4	0	192	56	212	0	0.1	0.03	26		270
12- 6-60				3.34	2.06	4.52	0.10		3.15	1.17	5.98					550	
				33	21	45	1		31	11	56					589	
18S/ 2W-22L 2 S	71	8.2	2558	164	77	233	8	0	232	116	635	29	0.4	0.11	--	1990	726
6-23-64				8.18	6.33	10.13	0.20		3.80	2.42	17.91	0.47					
				33	25	41	1		15	10	73	2				1377	
18S/ 2W-22L 3 S	72	7.6	4500	373	150	420	4	0	354	351	1286	17	0.1	0.29	25	3092	1549
1-31-63				18.61	12.34	18.26	0.10		5.80	7.31	36.27	0.27					
				38	25	37			12	15	73	1				2800	
185/ 2W-22N 1 S	77	7.9	1685	141	61	154	3	0	189	83	486	6.8	0.3	0.03	25	1338	603
7-10-63				7.04	5.02	6.70	0.08		3.10	1.73	13.71	0.11					
				37	27	36			17	9	74	1				1053	
185/ 2W-22N 3 S	--	7.0	790	48	13	96	13	0	85	30	179	63	0.2	0.14	--	520	174
6-23-64				2.40	1.07	4.17	0.33		1.39	0.62	5.05	1.02					
				30	13	52	4		17	8	63	13				484	
185/ 2W-23B 1 S	--	8.2	2530	184	92	263	3	0	207	141	784	1.2	0.6	0.28	22	1814	838
9-11-63				9.18	7.57	11.44	0.08		3.39	2.94	22.11	0.02					
				32	27	40			12	10	78					1593	
185/ 2W-23B 2 S	--	7.7	1370	80	32	163	2	0	211	56	333	1.2	0.6	0.11	37	914	331
9-11-63				3.99	2.63	7.09	0.05		3.46	1.17	9.39	0.02					
				29	19	52			25	8	67					809	
185/ 2W-23G 1 S	73	8.1	1170	74	32	135	2	0	223	56	262	3.1	0.3	0.05	28	735	316
7-10-63				3.69	2.63	5.87	0.05		3.65	1.17	7.39	0.05					
				30	21	48			30	10	60					702	
185/ 2W-23H 2 S	--	7.9	1340	76	32	175	5	0	201	60	344	3.7	0.6	0.08	28	878	321
7-10-63				3.79	2.63	7.61	0.13		3.29	1.25	9.70	0.06					
				27	19	54	1		23	9	68					823	
185/ 2W-23H 3 S	74	7.6	1260	74	33	153	2	0	201	53	312	5.0	0.4	0.06	35	816	320
7-10-63				3.69	2.71	6.65	0.05		3.29	1.10	8.80	0.08					
				28	21	51			25	8	66	1				766	
185/ 2W-23M 1 S	73	8.0	932	76	6	114	3	0	186	28	206	2.5	0.2	0.05	31	570	214
7-10-63				3.79	0.49	4.96	0.08		3.05	0.58	5.81	0.04					
				41	5	53	1		32	6	61					558	

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C Evap 105°C Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million, equivalents per million, percent reactance value									Chemical constituents in parts per million				
							OTAY HYDRO UNIT				Z1000						
OTAY HYDRO SUBUNIT				21080													
18S/ 2W-24F 1 S	74	7.4	1600	80	40	228	3	0	247	93	390	0	0.2	0.30	31	1116	364
11- 1-63				3.99	3.29	9.91	0.08		4.05	1.94	11.00						
				23	19	57			24	11	65					987	
18S/ 2W-24G 1 S	71	7.2	1565	77	36	153	2	0	233	47	331	0	0	0.14	30	987	340
6-10-59				3.84	2.96	6.65	0.05		3.82	0.98	9.33						
				28	22	49			27	7	66					791	
18S/ 2W-24J 1 S	74	7.3	1304	56	29	136	2	0	182	42	273	0	0	0	32	816	259
6-10-59				2.79	2.38	5.91	0.05		2.98	0.87	7.70						
				25	21	53			26	8	67					659	
18S/ 2W-24M 1 S	--	7.5	1478	80	29	148	3	0	200	36	333	0	0.2	0	28	932	319
7-15-59				3.99	2.38	6.44	0.08		3.28	0.75	9.39						
				31	18	50	1		24	6	70					756	
18S/ 2W-24M 2 S	--	7.6	1716	98	43	186	2	0	232	110	377	0	0.2	0.15	17	1124	422
7-15-59				4.89	3.54	8.09	0.05		3.80	2.29	10.63						
				30	21	49			23	14	64					947	
18S/ 2W-24M 3 S	72	7.3	1590	93	39	240	3	0	242	110	418	0	0.4	0	28	1178	393
3- 7-63				4.64	3.21	10.44	0.08		3.97	2.29	11.79						
				25	17	57			22	13	65					1050	
18S/ 2W-26B 1 S	73	7.8	1320	26	11	245	5	0	211	62	298	0	0.4	0.26	21	756	110
1-30-63				1.30	0.90	10.65	0.13		3.46	1.29	8.40						
				10	7	82	1		26	10	64					772	
18S/ 2W-260 1 S	--	8.0	1460	67	17	213	2	0	188	62	250	161	0.4	--	--	736	237
1-20-63				3.34	1.40	9.26	0.05		3.08	1.29	7.05	2.60					
				24	10	66			22	9	50	19				865	
18S/ 2W-26E 1 S	70	7.4	1400	79	32	165	1	0	195	143	296	0	0.4	0.20	25	868	329
2- 5-63				3.94	2.63	7.17	0.03		3.20	2.98	8.35						
				29	19	52			22	21	57					837	
18S/ 2W-26H 1 S	73	7.6	2100	114	45	275	5	0	192	265	454	0	0.4	0.26	21	1322	470
1-30-63				5.69	3.70	11.96	0.13		3.15	5.52	12.80						
				26	17	56	1		15	26	60					1274	
18S/ 2W-27A 2 S	74	8.0	1380	65	32	155	2	0	210	62	282	0	0.2	0.19	28	772	294
1-30-63				3.24	2.63	6.74	0.05		3.44	1.29	7.95						
				26	21	53			27	10	63					730	
18S/ 2W-27G 1 S	78	7.6	2640	156	75	225	4	0	192	166	638	0.7	0.1	0.06	32	1876	698
9- 3-59				7.78	6.17	9.78	0.10		3.15	3.46	17.99	0.01					
				33	26	41			13	14	73					1391	
18S/ 2W-27H 1 S	70	7.6	1220	66	27	163	2	0	217	93	258	0	0.2	0.19	31	708	276
1-30-63				3.29	2.22	7.09	0.05		3.56	1.94	7.28						
				26	18	56			28	15	57					747	
18S/ 2W-27J 1 S	71	7.3	2900	174	84	375	3	0	274	219	800	11	0.2	0.45	28	1964	780
1-31-63				8.68	6.91	16.31	0.08		4.49	4.56	22.56	0.18					
				27	22	51			14	14	71	1				1829	
18S/ 2W-27L 1 S	--	--	--	--	--	--	--	--	--	--	552	--	--	--	--		
3-28-51											15.57						
18S/ 2W-27L 3 S	--	6.9	2630	171	75	237	6	0	232	173	634	0	0 7	0.06	22	1680	736
8-12-59				8.53	6.17	10.30	0.15		3.80	3.60	17.88						
				34	25	41	1		15	14	71					1432	
18S/ 2W-28G 1 S	74	8.0	2030	95	36	292	8	0	250	127	493	1.9	0.2	0.21	24	1230	385
9- 3-59				4.74	2.96	12.70	0.20		4.10	2.64	13.90	0.03					
				23	14	62	1		20	13	67					1200	
18S/ 2W-28L 1 S	80	7.5	4371	226	121	547	6	0	341	213	1230	25	0.6	0.42	33	3002	1062
3- 4-64				11.28	9.95	23.78	0.15		5.59	4.43	34.69	0.40					
				25	22	53			12	10	77	1				2570	
OULZURA HYDRO SUBUNIT				Z10C0													
17S/ 1E- 3A 1 S	--	7.4	564	34	20	80	2	0	285	24	47	10.9	0.5	0.12	--		167
8-27-54				1.70	1.64	3.48	0.05		4.67	0.50	1.33	0.18				390	
				25	24	51	1		70	7	20	3				359	
17S/ 1E- 8K 1 S	64	7.5	1800	60	56	290	2	0	274	89	477	7.0	0.8	0	44	1206	380
3- 8-63				2.99	4.61	12.61	0.05		4.49	1.85	13.45	0.11					
				15	23	62			23	9	68	1				1161	
17S/ 1E- 9F 1 S	72	7.5	890	39	28	113	2	0	2	38	202	0	0.4	0.10	17	642	213
3- 8-63				1.95	2.30	4.91	0.05		0.03	0.79	5.70						
				21	25	53	1			12	87					440	
17S/ 1E-10A 1 S	--	7.1	1200	71	32	148	2	0	339	67	195	32	0.4	0.23	48	896	309
3- 8-63				3.54	2.63	6.44	0.05		5.56	1.39	5.50	0.52					
				28	21	51			43	11	42	4				762	

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
OTAY HYDRO UNIT 21000																	
DULZURA HYDRO SUBUNIT 210C0																	
17S/ 1E-10G 1 S	--	7.7	1080	43	43	130	3	0	212	73	216	11	0.4	0.19	41	762	285
11- 6-63				2.15	3.54	5.65	0.08		3.47	1.52	6.09	0.18					
				19	31	49	1		31	13	54	2				665	
17S/ 1E-14M 1 S	72	7.5	540	32	16	63	1	0	189	18	71	0.5	0.2	0.09	28	334	146
3-21-63				1.60	1.32	2.74	0.03		3.10	0.37	2.00	0.01					
				28	23	48	1		57	7	36					323	
17S/ 1E-15H 1 S	--	7.4	851	42	25	91	2	0	214	30	138	6.8	0.1	0.07	31	572	208
9- 9-57				2.10	2.06	3.96	0.05		3.51	0.62	3.89	0.11					
				26	25	48	1		43	8	48	1				471	
17S/ 1E-25A 1 S	--	7.5	735	49	27	93	1	0	220	41	140	9.0	0.4	0	43	560	234
3- 8-63				2.45	2.22	4.04	0.03		3.61	0.85	3.95	0.15					
				28	25	46			42	10	46	2				512	
17S/ 1E-26J 1 S	68	7.6	730	50	27	91	1	0	223	58	123	7.0	0.4	0	23	544	236
3- 8-63				2.50	2.22	3.96	0.03		3.65	1.21	3.47	0.11					
				29	25	45			43	14	41	1				490	
17S/ 1E-35D 1 S	64	7.4	590	33	16	64	1	--	162	39	79	0.8	0.3	0	30	351	149
5- 5-58				1.65	1.32	2.78	0.03		2.66	0.81	2.23	0.01					
				29	23	48	1		47	14	39					343	
17S/ 2E- 3N 1 S	--	7.4	580	28	22	67	1	0	180	38	92	0.0	0.4	0.05	39	398	161
3- 8-63				1.40	1.81	2.91	0.03		2.95	0.79	2.59						
				23	29	47			47	12	41					376	
17S/ 2E- 5M 1 S	54	7.4	620	46	17	64	1	0	195	35	94	0.0	1.0	0	34	416	185
3- 8-63				2.30	1.40	2.78	0.03		3.20	0.73	2.65						
				35	22	43			49	11	40					388	
17S/ 2E- 6D 1 S	--	7.3	600	40	19	69	1	0	220	46	74	8.0	0.6	0.05	44	412	178
3- 8-63				2.00	1.56	3.00	0.03		3.61	0.96	2.09	0.13					
				30	24	46			53	14	31	2				410	
17S/ 2E-10A 1 S	60	6.9	1700	163	55	155	5	0	281	132	390	47	0.2	0.05	36	1176	633
3- 8-63				8.13	4.52	6.74	0.13		4.61	2.75	11.00	0.76					
				42	23	35	1		24	14	58	4				1121	
17S/ 2E-29J 1 S	61	7.4	963	68	22	103	3	0	233	51	177	0.6	1.2	0.16	44	577	260
4-28-64				3.39	1.81	4.48	0.08		3.82	1.06	4.99	0.01					
				35	19	46	1		39	11	51					584	
17S/ 2E-32D 1 S	70	7.7	1460	91	40	160	3	0	348	74	268	0	0.2	0.17	25	894	392
3-21-63				4.54	3.29	6.96	0.08		5.70	1.54	7.56						
				31	22	47	1		39	10	51					832	
18S/ 2E- 3P 1 S	68	7.2	1288	95	44	106	4	0	311	85	162	79.4	0.2	0.10	43	805	418
7- 2-58				4.74	3.62	4.61	0.10		5.10	1.77	4.57	1.28					
				36	28	35	1		40	14	36	10				772	
18S/ 2E-10E 1 S	--	--	7400	35	27	116	2	0	250	88	99	5.0	0.4	0.14	48	582	199
3-21-63				1.75	2.22	5.04	0.05		4.10	1.83	2.79	0.08					
				19	25	56	1		47	21	32	1				543	
18S/ 2E-10M 2 S	58	7.7	720	41	22	81	3	0	232	41	91	21	0.4	0.11	49	472	193
3-21-63				2.05	1.81	3.52	0.08		3.80	0.85	2.57	0.34					
				27	24	47	1		50	11	34	4				464	
17S/ 1W-25A 1 S	64	7.6	658	30	19	101	1	0	124	15	175	0.0	0.1	0	9	444	153
3- 8-63				1.50	1.56	4.39	0.03		2.03	0.31	4.94						
				20	21	59			28	4	66					411	
TIA JUANA HYDRO UNIT 21100																	
TIA JUANA HYDRO SUBUNIT 211A0																	
18S/ 1W-26L 1 S	78	7.4	1732	60	6	299	8	0	183	47	400	1.5	0.2	0.18	22	1115	174
5- 5-58				2.99	0.49	13.00	0.20		3.00	0.98	11.28	0.02					
				18	3	78	1		20	6	74					934	
18S/ 1W-31H 1 S	91	7.2	2266	42	1	437	16	0	43	104	700	0	2.1	0.70	18	1473	109
5- 5-58				2.10	0.08	19.00	0.41		0.70	2.17	19.74						
				10		88	2		3	10	87					1342	
18S/ 1W-34F 1 S	--	8.0	1630	35	0	360	9	0	30	81	534	0.0	3.0	1.08	12	984	68
3- 7-63				1.75		15.65	0.23		0.49	1.69	15.06						
				10		89	1		3	10	87					1050	
18S/ 1W-34N 1 S	83	7.1	2080	54	1	391	2	0	49	43	651	0.2	2.6	1.07	200	1314	139
9- 1-59				2.69	0.08	17.00	0.05		0.80	0.90	18.36						
				14		86			4	4	92					1370	
18S/ 2W-27R 2 S	--	7.7	2850	192	62	370	3	0	439	222	656	6.0	0.6	0.43	21	1830	735
1-31-63				9.58	5.10	16.09	0.08		7.20	4.62	18.50	0.10					
				31	17	52			24	15	61					1749	
18S/ 2W-28P 1 S	97	7.9	1730	32	31	316	--	--	323	169	298	1.6	0.8	0.38	--		208
8-11-53				1.60	2.55	13.74			5.29	3.52	8.40	0.03				1071	
				9	14	77			31	20	49					1008	

TIA JUANA HYDRO UNIT 21100

TIA JUANA HYDRO SUBUNIT 211A0

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
18S/ 2W-29N 1 S	--	8.1	6000	311	146	850	5	0	342	274	1871	0	0.4	0.52	30	4088	1378
1-29-63				15.52	12.01	36.96	0.13		5.61	5.70	52.76						
				24	19	57			9	9	82					3656	
18S/ 2W-29P 1 S	--	8.0	4500	204	113	662	4	0	311	226	1357	4.0	0.4	0.55	29	2938	974
1-29-63				10.18	9.29	28.78	0.10		5.10	4.71	38.27	0.06					
				21	19	60			11	10	79					2753	
18S/ 2W-29P 2 S	--	8.1	4600	209	97	675	3	0	374	232	1287	10	0.4	0.50	34	2974	921
1-29-63				10.43	7.98	29.35	0.08		6.13	4.83	36.29	0.16					
				22	17	61			13	10	77					2732	
18S/ 2W-29P 4 S	69	8.1	4600	236	98	688	5	0	351	220	1365	8.0	0.4	0.52	32	3096	993
1-29-63				11.78	8.06	29.91	0.13		5.75	4.58	38.49	0.13					
				24	16	60			12	9	79					2825	
18S/ 2W-29P 5 S	--	7.8	5300	242	126	770	9	0	300	263	1605	23	0.2	0.61	26	3813	1123
4-11-63				12.08	10.36	33.48	0.23		4.92	5.48	45.26	0.37					
				22	18	60			9	10	81	1				3212	
18S/ 2W-32H 1 S	68	7.5	10549	452	301	1596	12	0	547	737	3250	3.7	1.0	0.90	27	7313	2367
3- 5-64				22.55	24.75	69.39	0.31		8.97	15.34	91.65	0.06					
				19	21	59			8	13	79					6650	
18S/ 2W-32N 1 S	--	7.9	5850	178	168	890	--	--	336	275	1775	--	1.0	0.70	--		1136
8-10-53				8.88	13.82	38.70			5.51	5.73	50.06					4052	
18S/ 2W-32P 1 S	70	7.5	5730	139	113	1047	21	0	928	492	1246	0	0.7	0.70	28	3620	812
10-23-57				6.94	9.29	45.52	0.54		15.21	10.24	35.14						
				11	15	73	1		25	17	58					3544	
18S/ 2W-32P 4 S	68	7.0	29412	774	1025	5340	134	0	330	1499	11375	5.6	1.1	1.16	24	22842	6151
3- 3-64				38.62	84.30	232.18	3.43		5.41	31.21	320.78	0.09					
				11	24	65	1		2	9	90					20341	
18S/ 2W-32Q 1 S	68	6.6	16670	880	531	2376	17	0	219	791	6025	6.2	0.9	0.54	21	13380	4383
3- 3-64				43.91	43.67	103.31	0.43		3.59	16.47	169.91	0.10					
				23	23	54			2	9	89					10756	
18S/ 2W-32Q 3 S	66	7.4	4880	308	123	490	6	0	350	218	1290	2.5	0.3	0.04	--		1276
3-25-55				15.37	10.12	21.31	0.15		5.74	4.54	36.38	0.04				2360	
				33	22	45			12	10	78					2610	
18S/ 2W-32R 1 S	--	7.6	3355	238	114	360	4	0	325	178	975	1.0	0.7	0.26	--		1064
8-18-55				11.88	9.38	15.65	0.10		5.33	3.71	27.50	0.02				2450	
				32	25	42			15	10	75					2031	
18S/ 2W-33J 1 S	63	8.0	2330	146	57	255	--	--	354	227	450	0.6	0.8	0.28	--		599
8-12-53				7.29	4.69	11.09			5.80	4.73	12.69	0.01				1479	
				32	20	48			25	20	55					1311	
18S/ 2W-33K 4 S	69	7.7	4227	297	127	466	12	0	407	612	940	1.0	0.9	0.47	--	3092	1264
6-23-64				14.82	10.44	20.26	0.31		6.67	12.74	26.51	0.02					
				32	23	44	1		15	28	58					2656	
18S/ 2W-33L 5 S	70	7.6	4805	296	133	561	8	0	510	391	1195	8.7	0.8	1.00	--	3217	1287
3- 4-64				14.77	10.94	24.39	0.20		8.36	8.14	33.70	0.14					
				29	22	48			17	16	67					2845	
18S/ 2W-33L 6 S	--	--	3420	--	--	--	--	--	--	--	637	--	--	--	--		
11- 4-58											17.96						
18S/ 2W-33L 7 S	--	7.2	3150	186	85	396	5	0	478	454	586	0	0.3	0.46	22	2150	814
6- 6-57				9.28	6.99	17.22	0.13		7.83	9.45	16.53						
				28	21	51			23	28	49					1970	
18S/ 2W-33M 2 S	70	7.4	5900	439	165	648	8	0	345	375	1738	0	0.5	0.49	23	3722	1775
4-25-61				21.91	13.57	28.18	0.20		5.65	7.81	49.01						
				34	21	44			9	13	78					3567	
18S/ 2W-33M 4 S	71	7.4	8230	581	255	753	7	0	287	356	2542	16	0.8	0.26	23	5525	2500
4-26-61				28.99	20.97	32.74	0.18		4.70	7.41	71.68	0.26					
				35	25	40			6	9	85					4675	
18S/ 2W-33N 2 S	68	7.3	5300	433	153	613	5	0	300	879	1298	0	0.4	0.39	12	4920	1711
4-16-63				21.61	12.58	26.65	0.13		4.92	18.30	36.60						
				35	21	44			8	31	61					3541	
18S/ 2W-33P 1 S	68	7.3	4100	314	106	425	6	0	333	695	835	9.3	0.9	0.10	19	2746	1220
11-19-62				15.67	8.72	18.48	0.15		5.46	14.47	23.55	0.15					
				36	20	43			13	33	54					2574	
18S/ 2W-33P 5 S	67	7.3	4500	321	120	517	2	0	342	391	1208	0	0.2	0.35	16		1296
10-26-61				16.02	9.87	22.48	0.05		5.61	8.14	34.07					3578	
				33	20	46			12	17	71					2744	
18S/ 2W-33P 7 S	69	7.6	4580	239	110	497	7	0	378	607	1042	6.8	0.8	0.16	21	3042	1050
11-19-62				11.93	9.05	21.61	0.18		6.20	12.64	29.38	0.11					
				28	21	51			13	26	61					2717	

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
TIA JUANA HYDRO SUBUNIT				211A0		TIA JUANA HYDRO UNIT					21100						
18S/ 2W-34A 1 S	--	7.3	5040	262	132	649	70	0	575	309	1305	11	0.6	0.56	26	3300	1197
6- 6-57				13.07	10.86	28.22	1.79		9.42	6.43	36.80	0.18					
				24	20	52	3		18	12	70					3046	
18S/ 2W-34A 2 S	70	7.8	2700	180	63	375	3	0	483	181	674	7.0	0.4	0.52	22	1850	704
1-31-63				8.98	5.18	16.31	0.08		7.92	3.77	19.01	0.11					
				29	17	53			26	12	62					1743	
18S/ 2W-34F 1 S	68	7.3	6800	373	152	1070	10	0	616	850	1798	0	0.4	1.00	--	4662	1561
6-22-64				18.61	12.58	46.52	0.26		10.10	17.70	50.70						
				24	16	60			13	23	65					4558	
18S/ 2W-34L 2 S	70	7.7	5400	329	117	860	8	0	594	939	1149	74	0.2	0.83	--	3820	1303
6-22-64				16.42	9.62	37.39	0.20		9.74	19.55	32.40	1.19					
				26	15	59			15	31	52	2				3769	
18S/ 2W-34L 4 S	59	7.8	2270	120	55	264	--	0	342	176	422	11.1	1.0	0.27	--		526
8-12-53				5.99	4.52	11.48			5.61	3.71	11.90	0.18				1346	
				27	21	52			26	17	56	1				1219	
18S/ 2W-34P 1 S	69	7.4	3900	323	90	475	6	0	348	735	798	8	0.6	0.43	--	2750	1177
6-22-64				16.12	7.40	20.65	0.15		5.70	15.30	22.50	0.13					
				36	17	47			13	35	52					2607	
18S/ 2W-34P 2 S	59	7.8	2210	98	64	246	--	--	366	127	404	7.9	1.1	0.29	--		508
8-12-53				4.89	5.26	10.70			6.00	2.64	11.39	0.13				1301	
				23	25	51			30	13	56	1				1126	
18S/ 2W-35D 1 S	--	--	--	--	--	--	--	--	--	--	552	--	--	--	--		
5-17-51											15.57						
18S/ 2W-35F 1 S	--	7.8	2350	78	55	370	5	0	314	180	555	0	0.4	0.45	14	1528	421
2- 8-62				3.89	4.52	16.09	0.13		5.15	3.75	15.65						
				16	18	65	1		21	15	64					1412	
18S/ 2W-35K 1 S	--	7.5	3000	188	80	395	3	0	529	211	693	14	0.8	0.50	21	1954	799
2- 6-63				9.38	6.58	17.17	0.08		8.67	4.39	19.54	0.23					
				28	20	52			26	13	60	1				1866	
18S/ 2W-35L 1 S	--	7.6	4500	303	105	630	9	0	546	315	1259	0	0.1	0.09	21	3122	1189
10-31-63				15.12	8.64	27.39	0.23		8.95	6.56	35.50						
				29	17	53			18	13	70					2911	
18S/ 2W-35N 2 S	61	7.9	2300	126	58	322	--	0	375	110	557	1.7	1.0	0.25	--		553
8-12-53				6.29	4.77	14.00			6.15	2.29	15.71	0.03				1504	
				25	19	56			25	9	65					1360	
18S/ 2W-35R 2 S	70	7.6	--	59	30	361	5	0	265	154	464	2.2	0.4	0.47	22	1215	271
8-12-59				2.94	2.47	15.70	0.13		4.34	3.21	13.08	0.04					
				14	12	74	1		21	16	63					1228	
18S/ 2W-36B 1 S	--	7.5	3820	127	51	561	6	0	206	196	1014	0	0.5	0.78	24	2295	527
8-11-59				6.34	4.19	24.39	0.15		3.38	4.08	28.59						
				18	12	70			9	11	79					2081	
19S/ 1W- 3E 1 S	83	7.9	2070	69	0	363	4	0	27	79	613	1.4	4.9	0.97	18	1213	172
9- 1-59				3.44		15.78	0.10		0.44	1.64	17.29	0.02					
				18		82	1		2	8	69					1166	
19S/ 2W- 1E 1 S	61	8.0	2370	114	62	264	--	--	366	129	447	8.8	0.8	0.28	--		540
8-12-53				5.69	5.10	11.48			6.00	2.69	12.61	0.14				1408	
				26	23	52			28	13	59	1				1206	
19S/ 2W- 1E 4 S	68	7.7	3820	224	91	460	6	0	421	284	950	0	0.7	0.72	21	2544	934
11-18-58				11.18	7.48	20.00	0.15		6.90	5.91	26.79						
				29	19	52			17	15	66					2244	
19S/ 2W- 1E 8 S	68	7.5	5663	295	121	741	9	0	518	446	1414	0	0.6	0.64	22	3744	1234
11-18-58				14.72	9.95	32.22	0.23		8.49	9.29	39.87						
				26	17	56			15	16	69					3304	
19S/ 2W- 1G 2 S	--	7.7	3760	182	113	406	--	--	415	203	850	1.2	1.1	0.45	--		919
8-12-53				9.08	9.29	17.65			6.80	4.23	23.97	0.02				2399	
				25	26	49			19	12	66					1961	
19S/ 2W- 1J 2 S	63	8.1	2900	198	66	374	--	0	415	213	691	14.6	1.0	0.37	--		766
8-11-53				9.88	5.43	16.26			6.80	4.43	19.49	0.24				2025	
				31	17	52			22	14	63	1				1762	
19S/ 2W- 1M 9 S	68	7.8	2860	159	63	342	6	0	427	221	566	14	0.8	0.65	19		656
12- 6-60				7.93	5.18	14.87	0.15		7.00	4.60	15.96	0.23				1490	
				28	18	53	1		25	17	57	1				1601	
19S/ 2W- 1M11 S	73	7.8	2780	182	76	350	6	0	375	252	702	12	0.6	0.20	21	1898	767
8-12-59				9.08	6.25	15.22	0.15		6.15	5.25	19.80	0.19					
				30	20	50			20	17	63	1				1786	
19S/ 2W- 1M14 S	68	8.0	2525	148	51	305	11	0	378	196	518	5.4	0.9	0.53	19		579
12- 6-60				7.39	4.19	13.26	0.28		6.20	4.08	14.61	0.09				1208	
				29	17	53	1		25	16	58					1441	

State well number Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C Evap 105°C Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million, equivalents per million, percent reactance value									Chemical constituents in parts per million				
TIA JUANA HYDRO SUBUNIT Z11A0				TIA JUANA HYDRO UNIT Z1100													
19S/ 2W- 1N 4 S 4-25-61	69	7.6	2300	127 6.34 28	50 4.11 18	283 12.30 54	6 0.15 1	0	348 5.70 25	152 3.16 14	489 13.79 61	5.6 0.09	1.1	0.16	25	1371 1310	523
19S/ 2W- 1N 6 S 10-31-63	--	8.2	1550	45 2.25 14	32 2.63 17	245 10.65 68	9 0.23 1	0	302 4.95 32	128 2.66 17	279 7.87 51	0	0.2	0.36	50	880 937	244
19S/ 2W- 2D 1 S 8-12-53	61	7.9	2410	128 6.39 29	48 3.95 18	270 11.74 53	--	--	342 5.61 26	126 2.62 12	474 13.37 62	2.0 0.03	0.9	0.30	--	 1422 1217	517
19S/ 2W- 2E 1 S 4-25-61	69	7.4	3390	210 10.48 30	82 6.74 19	409 17.78 51	8 0.20 1	0	360 5.90 17	361 7.52 22	722 20.36 58	69 1.11 3	1.0	0.22	22	2137 2061	862
19S/ 2W- 2K 1 S 8-12-53	61	7.9	2670	146 7.29 25	61 5.02 17	391 17.00 58	--	--	400 6.56 23	169 3.52 13	635 17.91 64	7.4 0.12	1.2	0.40	--	 1754 1608	616
19S/ 2W- 2L 3 S 8-11-53	61	8.1	3390	154 7.68 24	70 5.76 18	438 19.04 59	--	0	396 6.49 21	203 4.23 13	733 20.67 66	5.8 0.09	1.2	0.48	--	 2000 1800	673
19S/ 2W- 2L 5 S 8-11-53	61	7.6	3630	152 7.58 21	69 5.67 15	541 23.52 64	--	--	530 8.69 25	232 4.83 14	755 21.29 61	3.9 0.06	1.3	0.55	--	 2069 2015	663
19S/ 2W- 2R 1 S 8-12-53	61	7.7	3700	182 9.08 22	84 6.91 17	568 24.70 61	--	--	473 7.75 19	249 5.18 13	940 26.51 67	20.8 0.34 1	1.2	0.62	--	 2445 2278	800
19S/ 2W- 3A 1 S 4-12-60	--	7.7	2130	187 9.33 29	80 6.58 20	370 16.09 50	8 0.20 1	0	339 5.56 17	309 6.43 20	709 19.99 62	6.2 0.10	1.0	0.14	22	1924 1859	796
19S/ 2W- 3B 1 S 8-12-53	63	7.9	2860	190 9.48 29	82 6.74 21	375 16.31 50	--	--	497 8.15 26	276 5.75 18	631 17.79 56	2.0 0.03	1.0	0.38	--	 1991 1802	812
19S/ 2W- 3D 2 S 8-12-53	59	7.6	2130	116 5.79 29	48 3.95 20	228 9.91 50	--	--	366 6.00 31	108 2.25 12	383 10.80 57	1.1 0.02	0.9	0.30	--	 1247 1065	487
19S/ 2W- 3D 3 S 8-12-53	59	7.8	2660	142 7.09 29	59 4.85 20	282 12.26 51	--	0	403 6.61 28	221 4.60 19	444 12.52 52	14.9 0.24 1	0.9	0.30	--	 1400 1362	597
19S/ 2W- 3G 1 S 8-12-53	59	7.8	2350	148 7.39 29	62 5.10 20	306 13.30 52	--	--	408 6.69 27	194 4.04 16	510 14.38 57	1.5 0.02	1.1	0.33	--	 1579 1424	625
19S/ 2W- 3R 3 S 9- 2-59	72	7.3	1795	93 4.64 27	47 3.87 23	197 8.57 50	4 0.10 1	0	241 3.95 22	240 5.00 28	305 8.60 49	5.0 0.08	0.3	0.10	39	1119 1049	426
19S/ 2W- 4A 5 S 4-25-61	68	7.6	2350	119 5.94 26	52 4.28 19	283 12.30 54	3 0.08	0	289 4.74 21	199 4.14 19	477 13.45 60	0	0.6	0.37	19	 1710 1295	511
19S/ 2W- 4C 2 S 10-24-61	68	7.7	4000	265 13.22 27	83 6.83 14	650 28.26 58	5 0.13	0	497 8.15 16	510 10.62 21	1071 30.20 61	27 0.44 1	0.4	0.63	19	 3018 2875	1003
19S/ 2W- 4D 1 S 8-21-63	--	7.7	4600	309 15.42 30	124 10.20 20	588 25.57 50	9 0.23	0	388 6.36 13	430 8.95 18	1252 35.31 70	0	0.4	0.53	17	3380 2921	1282
19S/ 2W- 4D 4 S 4-18-62	70	7.3	4000	286 14.27 39	21 1.73 5	475 20.65 56	2 0.05	0	325 5.33 13	370 7.70 18	1023 28.85 69	0	0.3	0.42	24	 2748 2362	801
19S/ 2W- 4F 3 S 8-12-59	66	7.5	2160	142 7.09 31	54 4.44 20	251 10.91 48	8 0.20 1	0	336 5.51 25	194 4.04 19	425 11.99 55	10.7 0.17 1	0.5	0.12	30	1347 1281	577
19S/ 2W- 4F 4 S 11-20-62	68	7.5	3525	220 10.98 30	100 8.22 23	386 16.78 47	1 0.03	0	415 6.80 19	514 10.70 30	645 18.19 50	31 0.50 1	0.8	0.14	24	2229 2126	961
19S/ 2W- 4H 4 S 8-11-53	57	7.8	3640	194 9.68 26	90 7.40 20	449 19.52 53	--	--	530 8.69 24	304 6.33 17	751 21.18 58	3.7 0.06	0.9	0.50	--	 2171 2054	855
19S/ 2W- 4H 7 S 6-23-64	72	7.6	2090	49 2.45 12	46 3.78 18	335 14.57 69	13 0.33 2	0	382 6.26 30	256 5.33 26	330 9.31 45	0	0.6	0.45	--	1275 1218	312
19S/ 2W- 4J 7 S 1- 7-58	--	--	4700	--	--	--	--	--	--	--	1148 32.37	--	--	--	--		

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
Date sampled				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
TIA JUANA HYDRO UNIT Z1100																	
TIA JUANA HYDRO SUBUNIT Z11A0																	
19S/ 2W- 4K 2 S	--	7.1	1680	82	39	223	--	0	183	156	365	1.6	1.3	0.28	--		365
9- 3-53				4.09	3.21	9.70			3.00	3.25	10.29	0.03				1144	
				24	19	57			18	20	62					958	
19S/ 2W- 4L 1 S	68	7.4	3400	295	100	465	4	0	433	662	752	43	0.2	0.63	19	2870	1148
11- 1-63				14.72	8.22	20.22	0.10		7.10	13.78	21.21	0.69					
				34	19	47			17	32	50	2				2554	
19S/ 2W- 4L 4 S	--	7.6	1980	186	54	148	3	0	257	354	314	0	0.6	0.18	31	1310	687
6- 6-57				9.28	4.44	6.44	0.08		4.21	7.37	8.85						
				46	22	32			21	36	43					1217	
19S/ 2W- 5A 3 S	68	7.2	4458	82	95	587	19	0	95	23	1375	53	0.3	0.14	--	2504	600
3- 5-64				4.09	7.90	25.52	0.49		1.56	0.48	38.76	0.85					
				11	21	67	1		4	1	93	2				2282	
19S/ 2W- 5B 6 S	67	7.6	9524	570	282	1173	10	0	255	454	3140	6.2	0.9	0.34	25	6870	2584
3- 3-64				28.44	23.19	51.00	0.26		4.18	9.45	88.55	0.10					
				28	23	50			4	9	87					5787	
19S/ 2W- 5C 2 S	--	--	3530	--	--	--	--	--	--	--	713	--	--	--	--		
12- 3-57											20.11						
19S/ 2W- 5C 6 S	68	7.3	23419	670	733	4325	40	0	354	1267	8900	6.2	0.9	1.15	22	17580	4689
3- 4-64				33.43	60.28	188.05	1.02		5.80	26.38	250.98	0.10					
				12	21	67			2	9	89					16139	
19S/ 2W- 5G 3 S	--	--	7150	--	--	--	--	--	--	--	1960	--	--	--	--		
10- 1-57											55.27						
19S/ 2W- 5G 5 S	66	7.3	4808	252	107	740	5	0	495	420	1320	3.0	1.2	0.66	--		1069
3-17-55				12.57	8.80	32.18	0.13		8.11	8.74	37.22	0.05				3145	
				23	16	60			15	16	69					3092	
19S/ 2W- 5G18 S	68	7.3	8651	432	242	1175	8	0	156	515	2790	5.6	0.9	0.54	16	6009	2075
3- 4-64				21.56	19.90	51.09	0.20		2.56	10.72	78.68	0.09					
				23	21	55			3	12	85					5262	
19S/ 2W- 5K 1 S	69	7.2	5200	270	133	690	6	--	375	577	1300	--	0.9	0.47	30	3469	1221
6-25-58				13.47	10.94	30.00	0.15		6.15	12.01	36.66						
19S/ 2W- 5L 2 S	70	7.3	9833	464	271	1346	18	0	325	541	3075	6.2	0.9	0.60	21	7493	2274
3- 4-64				23.15	22.29	58.52	0.46		5.33	11.26	86.72	0.10					
				22	21	56			5	11	84					5904	
19S/ 2W- 5Q 2 S	69	7.3	2900	236	66	340	5	0	296	346	691	0	0.4	0.41	29	1920	861
11- 1-63				11.78	5.43	14.78	0.13		4.85	7.20	19.49						
				37	17	46			15	23	62					1859	
19S/ 2W- 5Q 3 S	70	7.9	5860	467	109	708	6	0	299	658	1581	12	1.0	0.24	32	4086	1614
11-20-62				23.30	8.96	30.78	0.15		4.90	13.70	44.58	0.19					
				37	14	49			8	22	70					3721	
POTRERO HYDRO SUBUNIT Z11B0																	
17S/ 4E-30P 1 S	--	7.5	425	23	11	48	3	0	134	6	55	19	0.3	0.04	52	251	103
8-11-62				1.15	0.90	2.09	0.08		2.20	0.12	1.55	0.31					
				27	21	50	2		53	3	37	7				283	
18S/ 2E-14C 1 S	--	7.2	555	24	20	66	2	0	212	25	61	1.0	0.6	0.08	57	360	142
6-24-64				1.20	1.64	2.87	0.05		3.47	0.52	1.72	0.02					
				21	28	50	1		61	9	30					361	
18S/ 2E-14E 1 S	80	7.4	1825	95	60	199	2	0	426	142	297	0	0.6	0.45	44	1185	484
7- 2-58				4.74	4.93	8.65	0.05		6.98	2.96	8.38						
				26	27	47			38	16	46					1049	
18S/ 3E- 7N 1 S	--	7.4	917	72	26	79	3	0	217	49	160	2.5	1.0	0.07	26	570	287
6-25-64				3.59	2.14	3.43	0.08		3.56	1.02	4.51	0.04					
				39	23	37	1		39	11	49					525	
18S/ 4E- 8Q 1 S	--	7.1	485	35	12	52	2	0	198	8	60	3.3	0.2	0.05	35	355	137
9- 9-57				1.75	0.99	2.26	0.05		3.25	0.17	1.69	0.05					
				35	20	45	1		63	3	33	1				305	
18S/ 4E-18C 1 S	72	7.3	482	38	17	28	1	0	173	11	45	13.4	0	0.05	62	285	165
7-10-58				1.90	1.40	1.22	0.03		2.84	0.23	1.27	0.22					
				42	31	27	1		62	5	28	5				300	
18S/ 4E-18J 1 S	--	7.5	528	42	20	32	--	--	247	14	46	6.8	0.3	0.09	--		187
9-16-53				2.10	1.64	1.39			4.05	0.29	1.30	0.11				388	
				41	32	27			70	5	23	2				283	

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C / Evap 105°C / Computed	Total hardness as $CaCO_3$
				Chemical constituents in parts per million / equivalents per million / percent reactance value									Chemical constituents in parts per million				
TIA JUANA HYDRO UNIT 21100																	
BARRETT LAKE HYDRO SUBUNIT 211C0																	
17S/ 2E-12M 1 S	64	7.2	630	74	21	48	1	0	259	34	91	4.0	0.1	0	36	466	271
3- 8-63				3.69	1.73	2.09	0.03		4.25	0.71	2.57	0.06					
				49	23	28			56	9	34	1				436	
17S/ 3E- 4L 1 S	--	7.3	980	68	27	99	1	0	302	45	131	14	0.7	0.07	53	561	281
8- 8-62				3.39	2.22	4.30	0.03		4.95	0.94	3.69	0.23					
				34	22	43			50	10	38	2				587	
MONUMENT HYDRO SUBUNIT 211D0																	
15S/ 4E-25C 1 S	60	7.0	412	34	14	34	2	0	114	67	32	6.0	0.2	0.03	26	254	143
7- 2-62				1.70	1.15	1.48	0.05		1.87	1.39	0.90	0.10					
				39	26	34	1		44	33	21	2				271	
15S/ 4E-26J 1 S	60	7.0	523	47	12	43	2	0	146	56	63	4.0	0.6	0.12	22	328	167
7- 2-62				2.35	0.99	1.87	0.05		2.39	1.17	1.78	0.06					
				45	19	36	1		44	22	33	1				321	
15S/ 4E-36F 1 S	58	6.9	514	45	18	35	1	--	192	38	40	7.4	0.4	0	30	326	187
5-14-58				2.25	1.48	1.52	0.03		3.15	0.79	1.13	0.12					
				43	28	29	1		61	15	22	2				309	
15S/ 5E- 30S1 S	48	7.6	372	42	11	18	3	0	166	30	21	1.5	0.2	0	38	254	150
4-29-64				2.10	0.90	0.78	0.08		2.72	0.62	0.59	0.02					
				54	23	20	2		69	16	15	1				246	
15S/ 5E-15L 1 S	--	6.7	251	24	9	12	1	0	95	--	22	18.6	0.1	0	--		97
7-23-53				1.20	0.74	0.52	0.03		1.56		0.62	0.30				132	
COTTONWOOD HYDRO SUBUNIT 211F0																	
16S/ 5E- 6M 1 S	--	6.6	271	16	10	22	1	0	79	17	33	4.8	0.2	0	39	205	81
4-29-64				0.80	0.82	0.96	0.03		1.29	0.35	0.93	0.08					
				31	31	37	1		49	13	35	3				182	
16S/ 5E- 6M 2 S	--	7.6	247	16	10	20	1	0	100	1	29	1.2	0.2	0.02	2	135	81
4-29-64				0.80	0.82	0.87	0.03		1.64	0.02	0.82	0.02					
				32	33	35	1		66	1	33	1				130	
16S/ 5E-17LS1 S	--	8.0	976	94	21	76	4	--	238	79	150	0.6	0.8	1.40	--	585	321
10-30-53				4.69	1.73	3.30	0.10		3.90	1.64	4.23	0.01					
				48	18	34	1		40	17	43					544	
16S/ 5E-29P 1 S	77	7.5	493	34	18	44	2	0	219	24	35	0	0.4	0	35	361	159
7-23-58				1.70	1.48	1.91	0.05		3.59	0.50	0.99						
				33	29	37	1		71	10	19					300	
17S/ 5E- 4C 2 S	--	7.1	866	87	36	56	3	0	117	329	35	0.5	0.6	0.10	40	660	365
6-26-64				4.34	2.96	2.43	0.08		1.92	6.85	0.99	0.01					
				44	30	25	1		20	70	10					645	
17S/ 5E- 5D 1 S	--	7.5	700	57	21	63	4	0	310	33	59	6.0	0.2	0.07	29	408	229
7- 3-62				2.84	1.73	2.74	0.10		5.08	0.69	1.66	0.10					
				38	23	37	1		67	9	22	1				425	
17S/ 5E- 8R 1 S	--	7.0	400	28	11	38	4	0	203	9	46	14	0.4	0.05	32	264	115
7- 3-62				1.40	0.90	1.65	0.10		3.33	0.19	1.30	0.23					
				35	22	41	2		66	4	26	5				282	
17S/ 5E-10N 1 S	64	7.1	418	25	11	43	4	0	184	0	38	0	0.2	0	30	301	108
7-24-58				1.25	0.90	1.87	0.10		3.02		1.07						
				30	22	45	2		74		26					242	
CAMERON HYDRO SUBUNIT 211G0																	
17S/ 5E- 1K 1 S	68	7.2	469	33	10	37	4	0	228	66	29	19	0.2	0.08	27	378	124
7-24-58				1.65	0.82	1.61	0.10		3.74	1.37	0.82	0.31					
				39	20	39	2		60	22	13	5				337	
17S/ 5E- 2N 1 S	--	7.7	769	68	27	61	2	0	382	36	43	0	0.3	0.08	30	469	281
10-20-57				3.39	2.22	2.65	0.05		6.26	0.75	1.21						
				41	27	32	1		76	9	15					455	
17S/ 5E- 3R 1 S	86	7.6	532	52	19	48	3	0	256	40	40	1.5	0.8	0.04	--		208
7-14-53				2.59	1.56	2.09	0.08		4.20	0.83	1.13	0.02				362	
				41	25	33	1		68	13	18					330	

State well number / Date sampled	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million, equivalents per million, percent reactance value									Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO_3	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Nitrate NO_3	Fluoride F	Boron B	Silica SiO_2	TDS Evap 180°C Evap 105°C Computed	Total hardness as $CaCO_3$
						TIA JUANA HYDRO UNIT					21100						
CAMPO HYDRO SUBUNIT				211H0													
17S/ 5E-24F 1 S	--	8.0	348	24	10	37	2	0	176	5	23	2.0	0.6	0.05	37	230	101
6-26-64				1.20	0.82	1.61	0.05		2.88	0.10	0.65	0.03					
				33	22	44	1		79	3	18	1				227	
17S/ 5E-36B 1 S	62	7.5	337	26	7	37	2	0	160	4	30	2.8	0.5	0.03	33	228	94
4-28-64				1.30	0.58	1.61	0.05		2.62	0.08	0.85	0.05					
				37	16	45	1		73	2	24	1				221	
17S/ 6E-13M 1 S	--	7.6	341	24	7	37	2	0	137	4	37	6.8	0.3	0	34	182	89
8- 7-62				1.20	0.58	1.61	0.05		2.25	0.08	1.04	0.11					
				35	17	47	1		65	2	30	3				219	
17S/ 6E-25E 1 S	61	6.9	729	49	19	76	3	0	207	20	123	7.2	0.6	0	59	484	201
4-28-64				2.45	1.56	3.30	0.08		3.39	0.42	3.47	0.12					
				33	21	45	1		46	6	47	2				459	
17S/ 6E-33RS1 S	65	8.0	550	48	10	54	2	0	232	--	49	4.3	--	0.10	--		161
10-24-52				2.40	0.82	2.35	0.05		3.80		1.38	0.07					
18S/ 3E-24N 1 S	71	7.3	706	62	20	53	4	0	252	7	95	3.6	0.2	0.05	47	423	237
7- 8-58				3.09	1.64	2.30	0.10		4.13	0.15	2.68	0.06					
				43	23	32	1		59	2	38	1				416	
18S/ 3E-25G 2 S	--	8.4	606	2	2	144	--	--	223	22	75	3.3	0.3	0.05	--		13
9-16-53				0.10	0.16	6.26			3.65	0.46	2.12	0.05				411	
				2	2	96			58	7	34	1				358	
18S/ 3E-25G 3 S	--	7.6	657	60	19	46	4	0	243	22	79	1.6	0.3	0.05	42	412	228
12-19-61				2.99	1.56	2.00	0.10		3.98	0.46	2.23	0.03					
				45	23	30	2		59	7	33					393	
18S/ 4E-24G 1 S	--	7.5	430	20	15	47	3	0	171	19	39	3.5	0.4	0.04	47	270	112
6-25-64				1.00	1.23	2.04	0.08		2.80	0.40	1.10	0.06					
				23	28	47	2		64	9	25	1				278	
18S/ 5E- 1B 1 S	--	7.2	398	23	11	42	2	0	156	7	44	2.0	0.4	0.08	45	255	103
6-24-64				1.15	0.90	1.83	0.05		2.56	0.15	1.24	0.03					
				29	23	47	1		64	4	31	1				253	
18S/ 5E- 1G 1 S	--	7.7	433	31	9	52	2	0	181	--	42	6.0	0.5	0.09	39	300	115
8- 7-62				1.55	0.74	2.26	0.05		2.97		1.18	0.10					
18S/ 5E- 9K 1 S	--	7.7	680	59	18	63	4	0	299	11	66	6.8	0.4	0.07	28	354	221
8- 8-62				2.94	1.48	2.74	0.10		4.90	0.23	1.86	0.11					
				40	20	38	1		69	3	26	2				403	
18S/ 5E-12Q 1 S	68	8.0	818	49	29	95	2	0	321	25	70	18	0.6	0.16	33	592	242
7-21-58				2.45	2.38	4.13	0.05		5.26	0.52	1.97	0.29					
				27	26	46	1		65	6	25	4				480	
18S/ 5E-16H 1 S	63	7.4	806	62	23	71	4	0	274	67	79	6	0.4	0.30	33	576	249
7-18-58				3.09	1.89	3.09	0.10		4.49	1.39	2.23	0.10					
				38	23	38	1		55	17	27	1				480	
18S/ 6E-12P 1 S	--	8.2	642	50	12	72	3	0	234	16	83	4.5	0.7	0.08	52	410	175
6-26-64				2.50	0.99	3.13	0.08		3.84	0.33	2.34	0.07					
				37	15	47	1		58	5	36	1				408	

PLATE I

KEY MAP

LEGEND

DRAINAGE PROVINCE BOUNDARY
HYDROLOGIC UNIT BOUNDARY
HYDROLOGIC SUBUNIT BOUNDARY
4.00 SEE NAMES AND AREAL CODE NUMBERS FOR COMPLETE DESIGNATION.

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT
GROUND WATER OCCURRENCE AND QUALITY
SAN DIEGO REGION

LOCATION OF HYDROLOGIC BOUNDARIES

SCALE OF MILES
4 0 4 8 12

1966

NAMES AND AREAL CODE NUMBERS
SAN DIEGO REGION

Code	Designation
Z-01.00	San Juan Hydrologic Unit
Z-01.AO	Laguna Hydrologic Subunit
Z-01.BO	San Juan Hydrologic Subunit
Z-01.CO	San Clemente Hydrologic Subunit
Z-01 DO	San Mateo Hydrologic Subunit
Z-01 EO	San Onofre Hydrologic Subunit
Z-02.00	Santa Margarita Hydrologic Unit
Z-02.AO	Ysidora Hydrologic Subunit
Z-02.BO	De Luz Hydrologic Subunit
Z-02.CO	Murrieta Hydrologic Subunit
Z-02.DO	Auld Hydrologic Subunit
Z-02 EO	Pechanga Hydrologic Subunit
Z-02.FO	Wilson Hydrologic Subunit
Z-02.GO	Anza Hydrologic Subunit
Z-02.HO	Aguanga Hydrologic Subunit
Z-02.IO	Oakgrove Hydrologic Subunit
Z-03.00	San Luis Rey Hydrologic Unit
Z-03.AO	Bonsall Hydrologic Subunit
Z-03.BO	Munserate Hydrologic Subunit
Z-03.CO	Warner Hydrologic Subunit
Z-04.00	Carlsbad Hydrologic Unit
Z-04 AO	Loma Alta Hydrologic Subunit
Z-04.BO	Vista Hydrologic Subunit
Z-04.CO	Agua Hedionda Hydrologic Subunit
Z-04.OO	Encinas Hydrologic Subunit
Z-04.EO	San Marcos Hydrologic Subunit
Z-04.FO	Escondido Hydrologic Subunit
Z-05 00	San Dieguito Hydrologic Unit
Z-05.AO	San Dieguito Hydrologic Subunit
Z-05 BO	Hodges Hydrologic Subunit
Z-05 CO	San Pasqual Hydrologic Subunit
Z-05.DO	Santa Maria Valley Hydrologic Subunit
Z-05.EO	Santa Ysabel Hydrologic Subunit
Z-06 00	Penasquitos Hydrologic Unit
Z-06.AO	Soledad Hydrologic Subunit
Z-06.BO	Poway Hydrologic Subunit
Z-06.CO	Scripps Hydrologic Subunit
Z-06.DO	Miramar Hydrologic Subunit
Z-06 EO	Tecolote Hydrologic Subunit
Z-07 00	San Diego Hydrologic Unit
Z-07.AO	Lower San Diego Hydrologic Subunit
Z-07.BO	San Vicente Hydrologic Subunit
Z-07.CO	El Capitan Hydrologic Subunit
Z-07.DO	Cuyamaca Hydrologic Subunit
Z-08.00	Coronado Hydrologic Unit
Z-08.AO	Point Loma Hydrologic Subunit
Z-08.BO	San Diego Mesa Hydrologic Subunit
Z-08.CO	Paradise Hydrologic Subunit
Z-09.00	Sweetwater Hydrologic Unit
Z-09.AO	Lower Sweetwater Hydrologic Subunit
Z-09.BO	Middle Sweetwater Hydrologic Subunit
Z-09 CO	Upper Sweetwater Hydrologic Subunit
Z-10.00	Otay Hydrologic Unit
Z-10.AO	Coronado Hydrologic Subunit
Z-10.BO	Otay Hydrologic Subunit
Z-10.CO	Dulzura Hydrologic Subunit
Z-11 00	Tia Juana Hydrologic Unit
Z-11.AO	Tia Juana Hydrologic Subunit
Z-11 BO	Potrero Hydrologic Subunit
Z-11.CO	Barrett Lake Hydrologic Subunit
Z-11.DO	Monument Hydrologic Subunit
Z-11 EO	Morena Hydrologic Subunit
Z-11.FO	Cottonwood Hydrologic Subunit
Z-11.GO	Cameron Hydrologic Subunit
Z-11.HO	Campo Hydrologic Subunit

KEY MAP

LEGEND

DRAINAGE PROVINCE BOUNDARY

HYDROLOGIC UNIT BOUNDARY

HYDROLOGIC SUBUNIT BOUNDARY

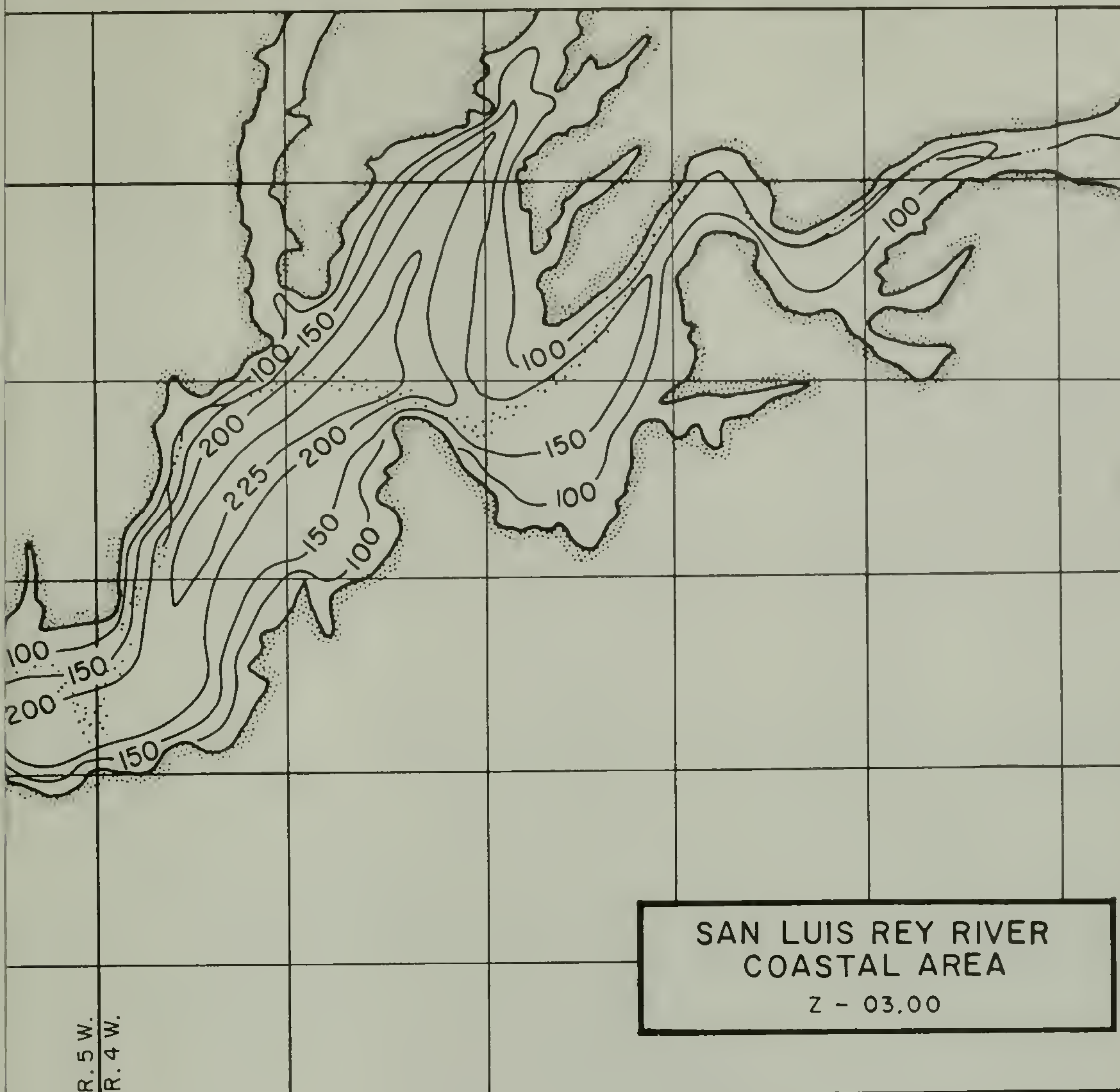
4.00 SEE NAMES AND AREAL CODE NUMBERS FOR COMPLETE DESIGNATION.

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT
GROUND WATER OCCURRENCE AND QUALITY
SAN DIEGO REGION

LOCATION OF HYDROLOGIC BOUNDARIES

SCALE OF MILES
4 0 4 8 12

1966



LEGEND

—— 100 —— LINE OF EQUAL THICKNESS OF VALLEY FILL

BOUNDARY OF VALLEY FILL AREA

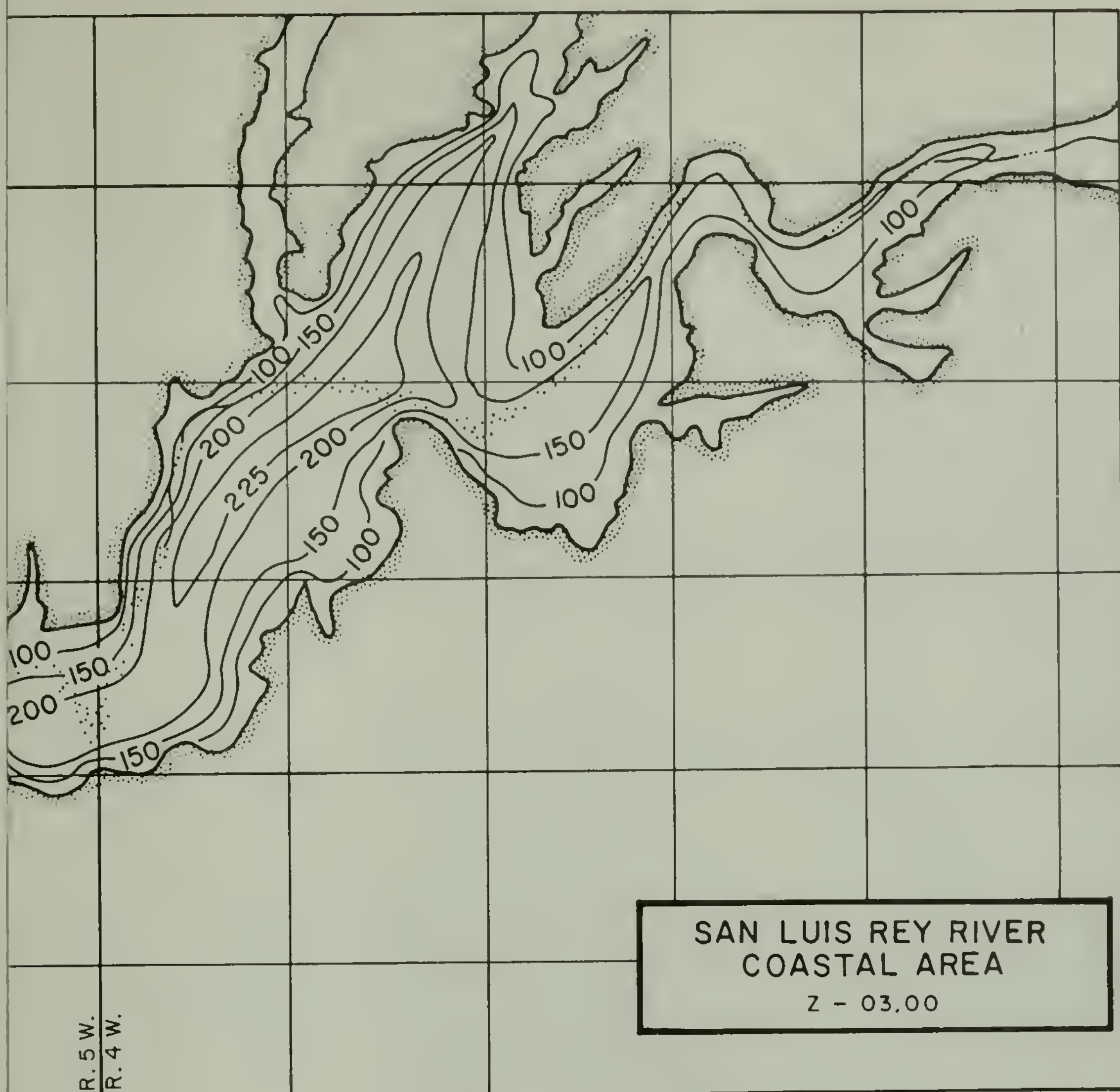
STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT
GROUND WATER OCCURRENCE AND QUALITY
SAN DIEGO REGION

LINES OF EQUAL THICKNESS OF VALLEY FILL
IN SELECTED AREAS

SCALE OF MILES

1 0 1 2

1968



LEGEND

—100— LINE OF EQUAL THICKNESS OF VALLEY FILL

BOUNDARY OF VALLEY FILL AREA

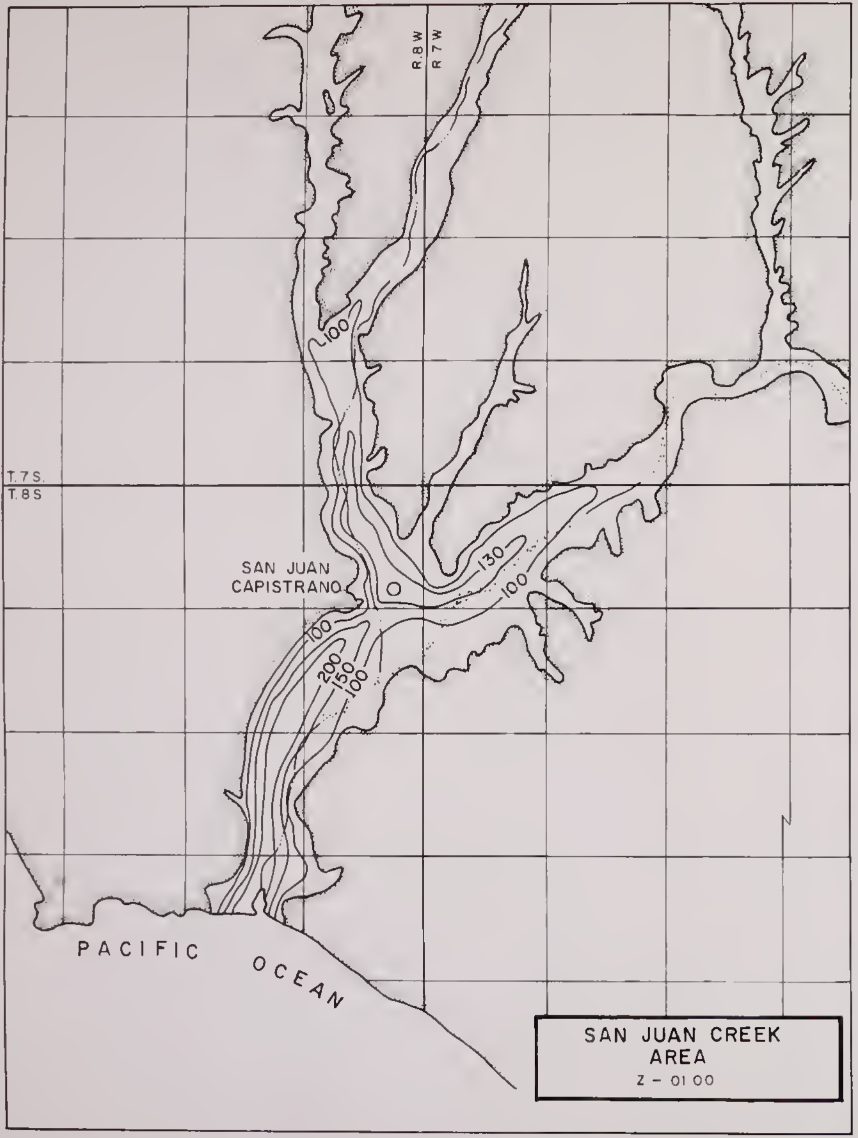
STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT
GROUND WATER OCCURRENCE AND QUALITY
SAN DIEGO REGION

LINES OF EQUAL THICKNESS OF VALLEY FILL
IN SELECTED AREAS

SCALE OF MILES

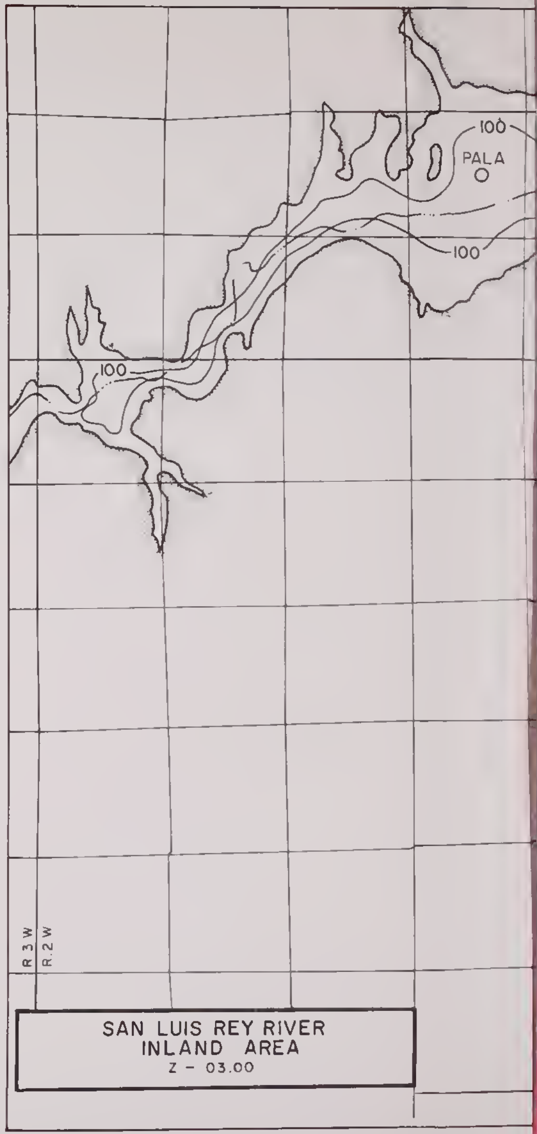
1 0 1 2

1966

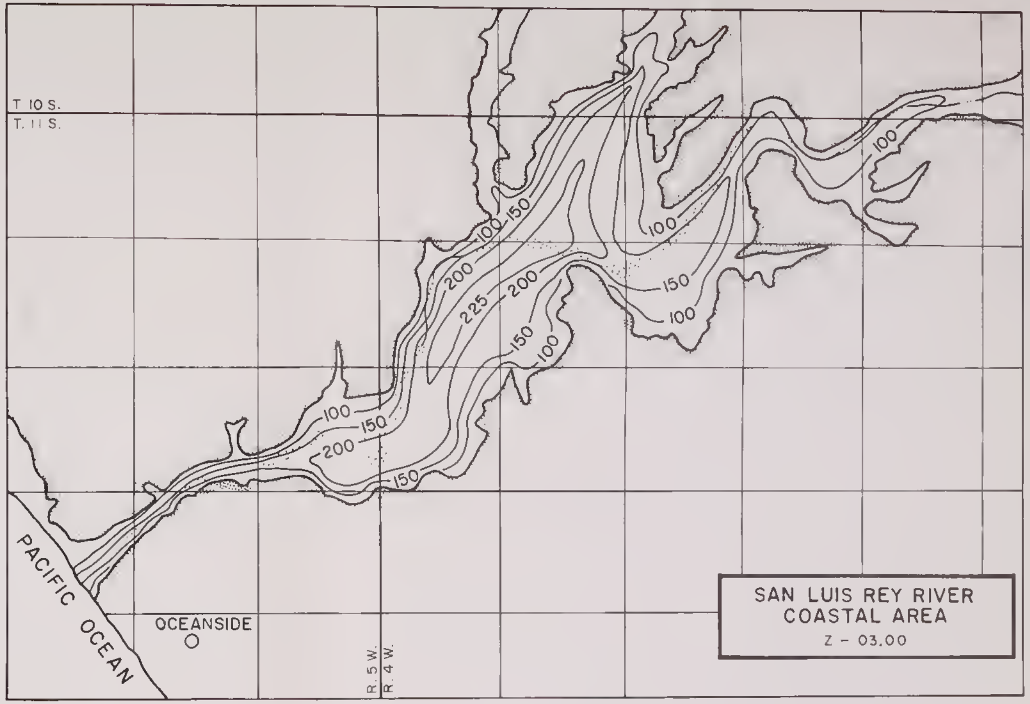


R 8 W
R 7 W
T. 7 S.
T. 8 S.
100
130
SAN JUAN
CAPISTRANO
100
200
150
100
PACIFIC OCEAN
SAN JUAN CREEK
AREA
Z - 01.00

100
150
150
100
T 10 S
T 11 S
150
200
200
150
PACIFIC OCEAN
CAMP
DEL MAR
R 5 W
R 4 W
SANTA MARGARITA
RIVER AREA
Z - 02.00



100
PALA
100
100
R 3 W
R 2 W
SAN LUIS REY RIVER
INLAND AREA
Z - 03.00



LEGEND

—100— LINE OF EQUAL THICKNESS OF VALLEY FILL

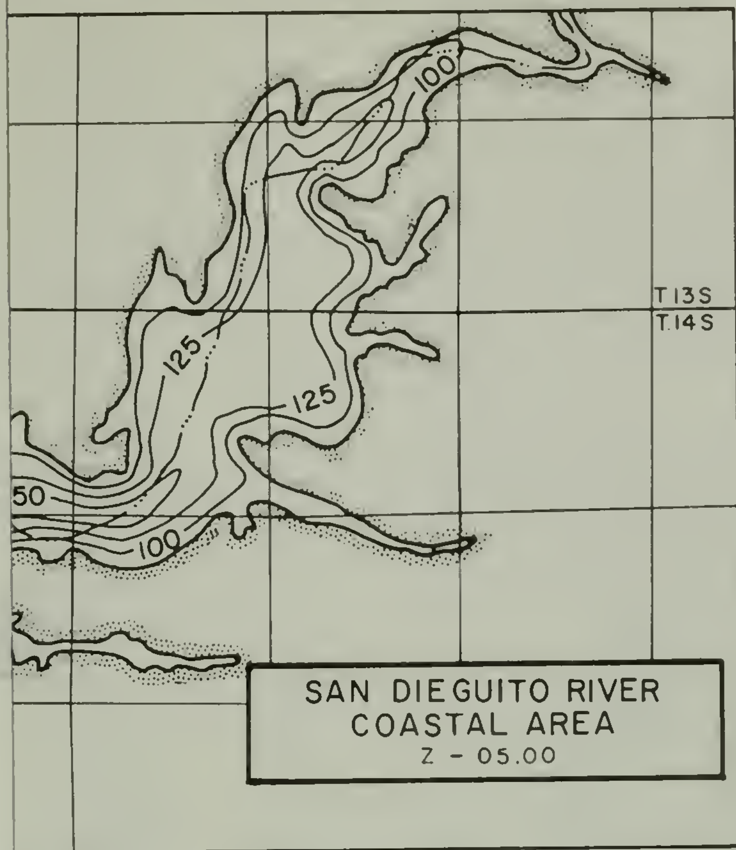
BOUNDARY OF VALLEY FILL AREA

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT
GROUND WATER OCCURRENCE AND QUALITY
SAN DIEGO REGION

LINES OF EQUAL THICKNESS OF VALLEY FILL
IN SELECTED AREAS

SCALE OF MILES
1 0 1 2

1968



LEGEND

— 125 —— LINE OF EQUAL THICKNESS OF VALLEY FILL

BOUNDARY OF VALLEY FILL AREA

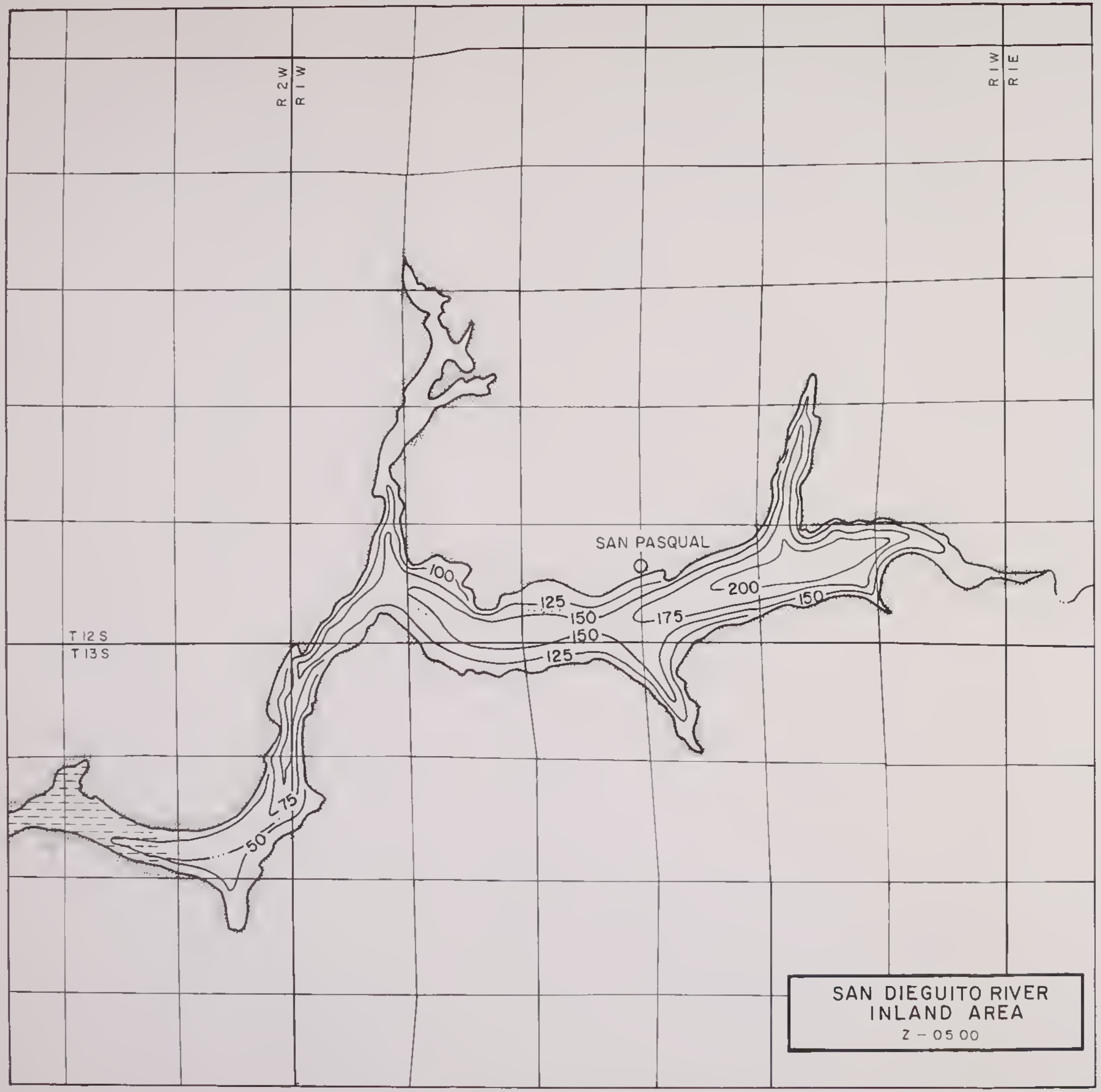
STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT
GROUND WATER OCCURRENCE AND QUALITY
SAN DIEGO REGION

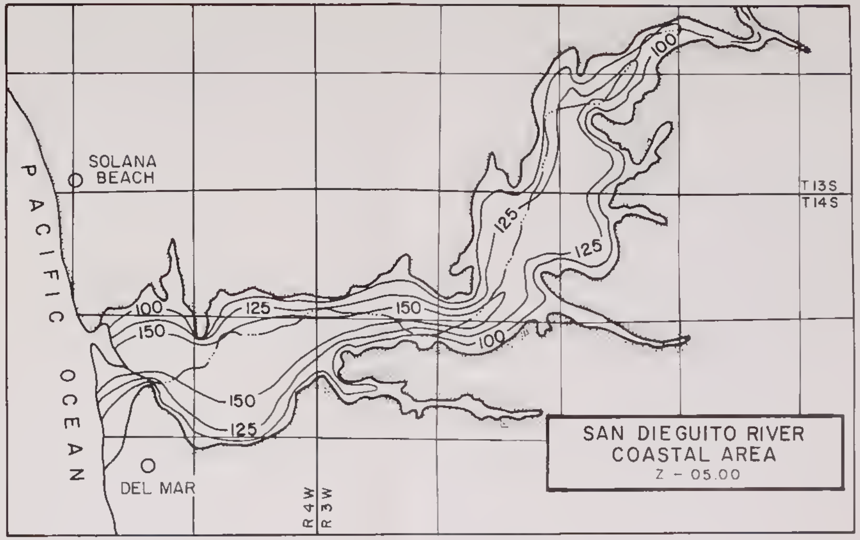
OF EQUAL THICKNESS OF VALLEY FILL
IN SELECTED AREAS

SCALE OF MILES

0 1 2

1966





LEGEND

— 125 — LINE OF EQUAL THICKNESS OF VALLEY FILL

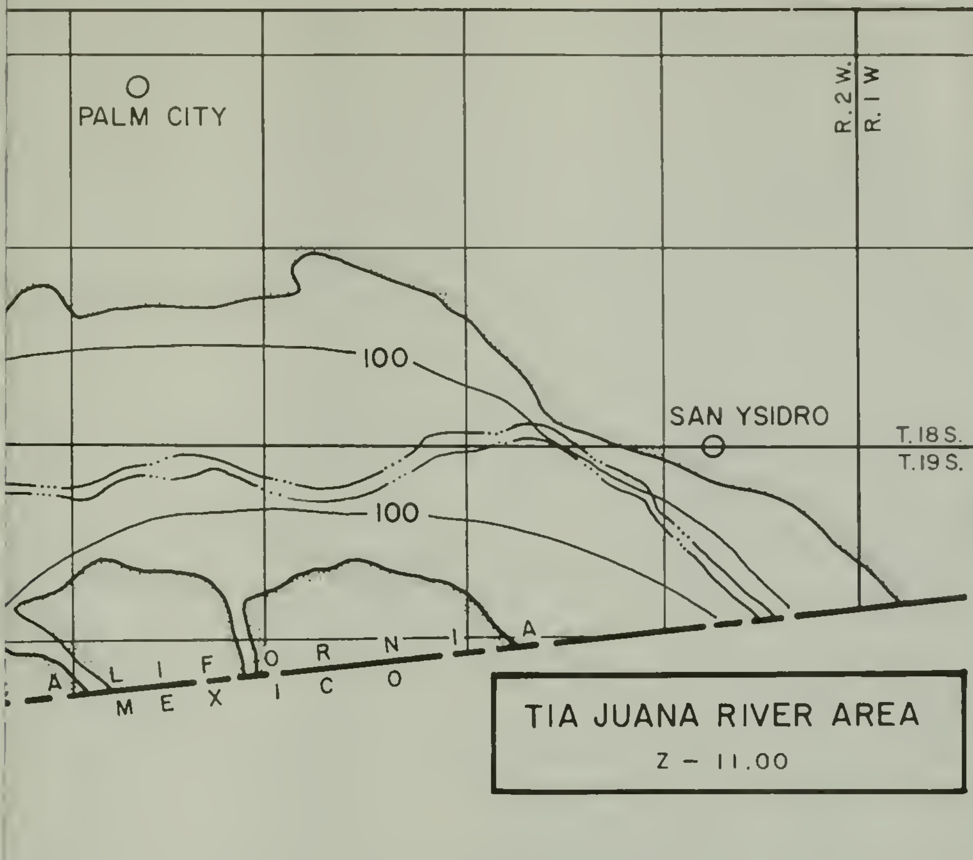
BOUNDARY OF VALLEY FILL AREA

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT
GROUND WATER OCCURRENCE AND QUALITY
SAN DIEGO REGION

LINES OF EQUAL THICKNESS OF VALLEY FILL
IN SELECTED AREAS

SCALE OF MILES
1 0 1 2

1966



LEGEND

—75— LINE OF EQUAL THICKNESS OF VALLEY FILL

BOUNDARY OF VALLEY FILL AREA

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT
GROUND WATER OCCURRENCE AND QUALITY
SAN DIEGO REGION

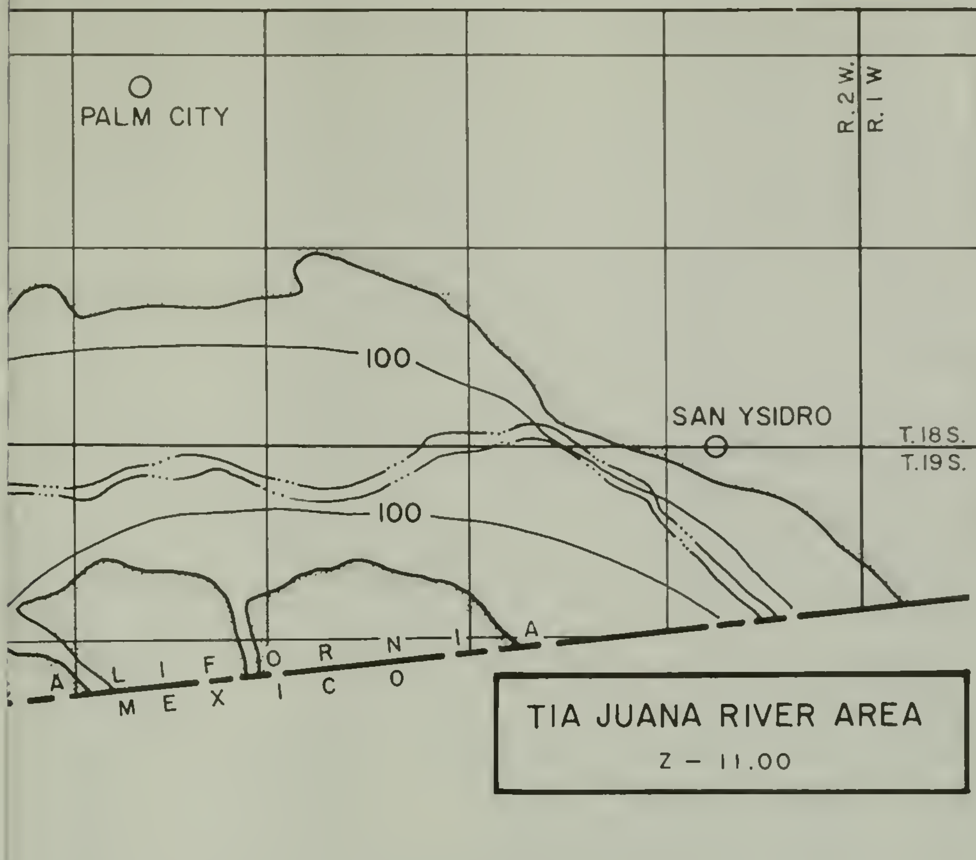
LINES OF EQUAL THICKNESS OF VALLEY FILL
IN SELECTED AREAS

SCALE OF MILES

1 0 1 2

1966

PLATE 4C



LEGEND

—75— LINE OF EQUAL THICKNESS OF VALLEY FILL

BOUNDARY OF VALLEY FILL AREA

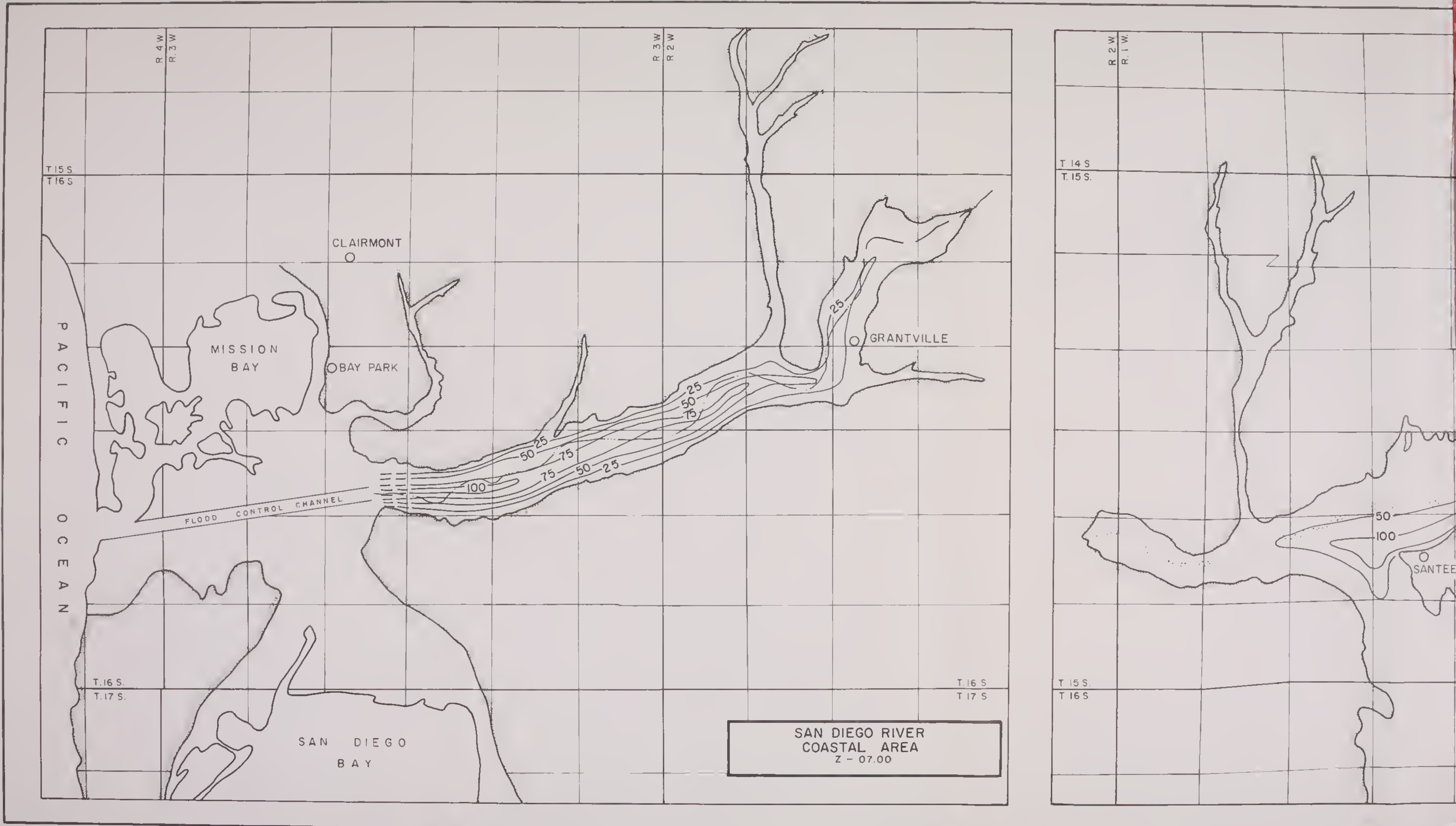
STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT
GROUND WATER OCCURRENCE AND QUALITY
SAN DIEGO REGION

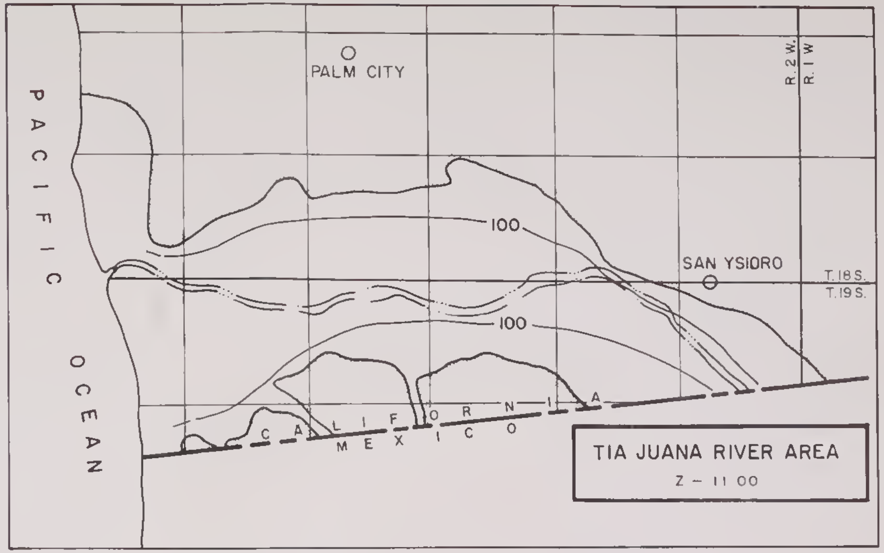
LINES OF EQUAL THICKNESS OF VALLEY FILL
IN SELECTED AREAS

SCALE OF MILES

1 0 1 2

1966


R 4 W
R 3 W
R 3 W
R 2 W
R 2 W
R 1 W.
T 15 S
T 16 S
T 14 S
T 15 S.
CLAIRMONT
MISSION BAY
BAY PARK
GRANTVILLE
PACIFIC OCEAN
FLOOD CONTROL CHANNEL
25
50
75
100
SANTEE
T. 16 S.
T. 17 S.
T 15 S.
T 16 S
SAN DIEGO BAY
SAN DIEGO RIVER
COASTAL AREA
Z - 07.00



LEGEND

—75— LINE OF EQUAL THICKNESS OF VALLEY FILL

BOUNDARY OF VALLEY FILL AREA

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT
GROUND WATER OCCURRENCE AND QUALITY
SAN DIEGO REGION

LINES OF EQUAL THICKNESS OF VALLEY FILL
IN SELECTED AREAS

SCALE OF MILES

1 0 1 2

1966

KEY MAP

LEGEND

DRAINAGE PROVINCE BOUNDARY

HYOROLOGIC UNIT BOUNDARY

—20— LINE OF EQUAL MEAN PRECIPITATION IN INCHES

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT

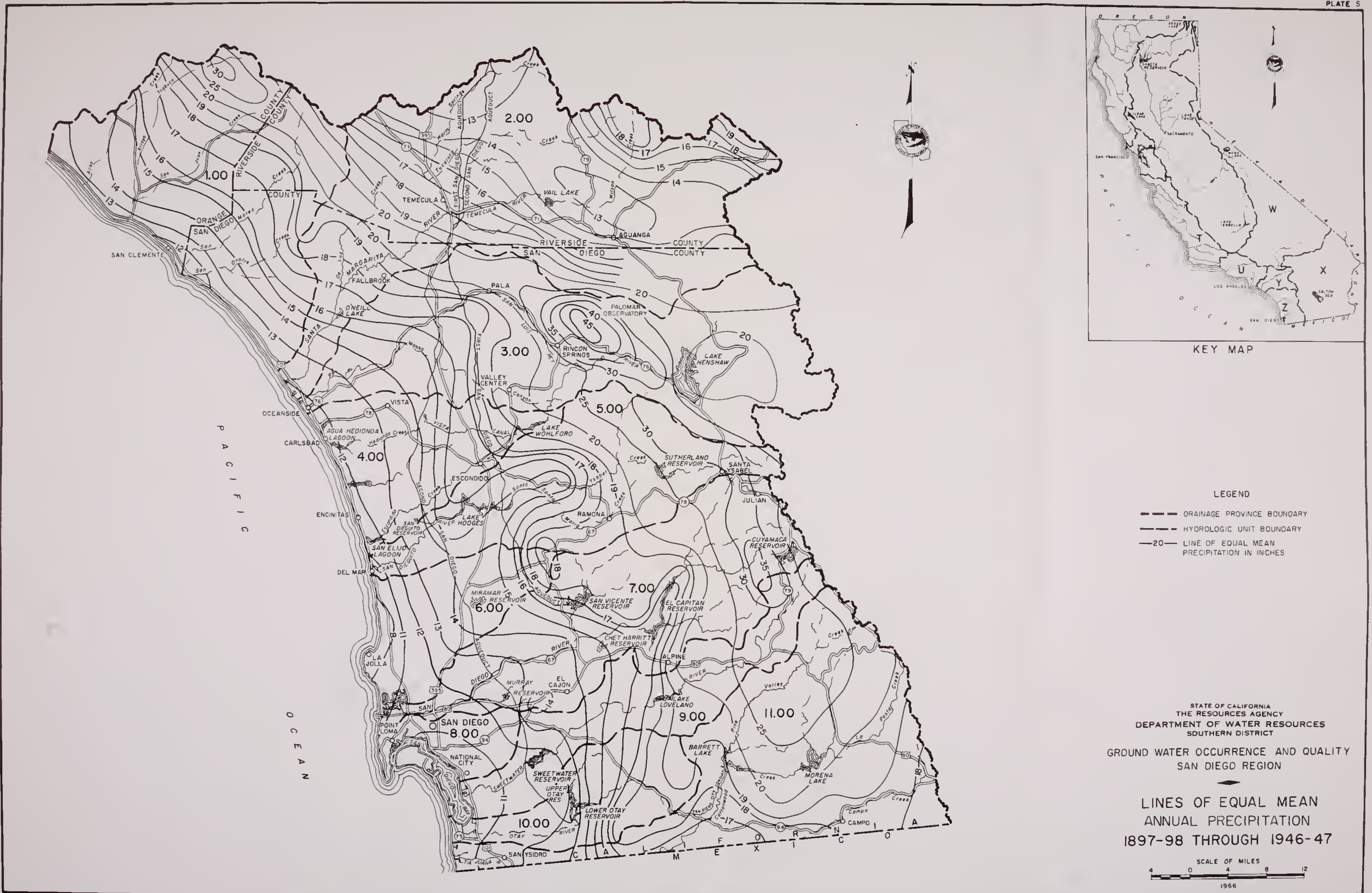
GROUND WATER OCCURRENCE AND QUALITY
SAN DIEGO REGION

LINES OF EQUAL MEAN ANNUAL PRECIPITATION 1897-98 THROUGH 1946-47

SCALE OF MILES

4 0 4 8 12

1966

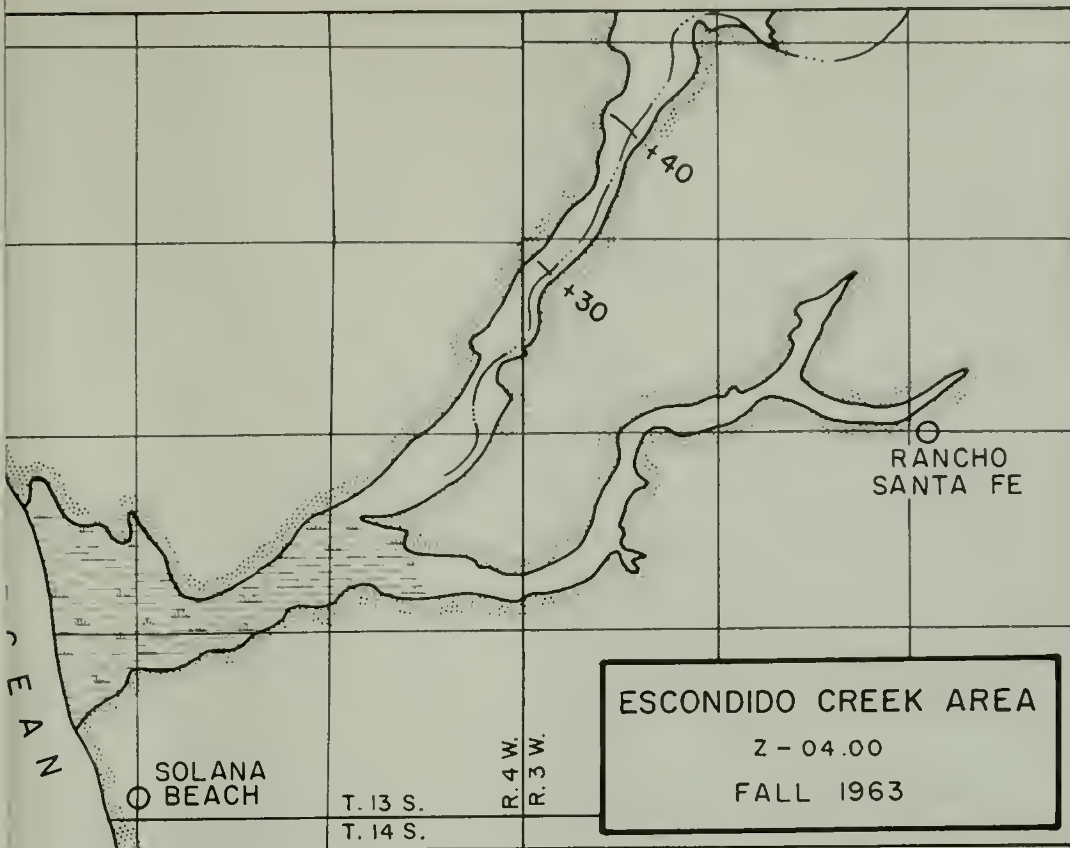


STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT

GROUND WATER OCCURRENCE AND QUALITY
SAN DIEGO REGION

LINES OF EQUAL MEAN ANNUAL PRECIPITATION 1897-98 THROUGH 1946-47

PLATE 7



LEGEND

—— +40 —— LINE OF EQUAL ELEVATION OF WATER IN WELLS IN ALLUVIUM (QAL)

BOUNDARY OF VALLEY FILL AREA

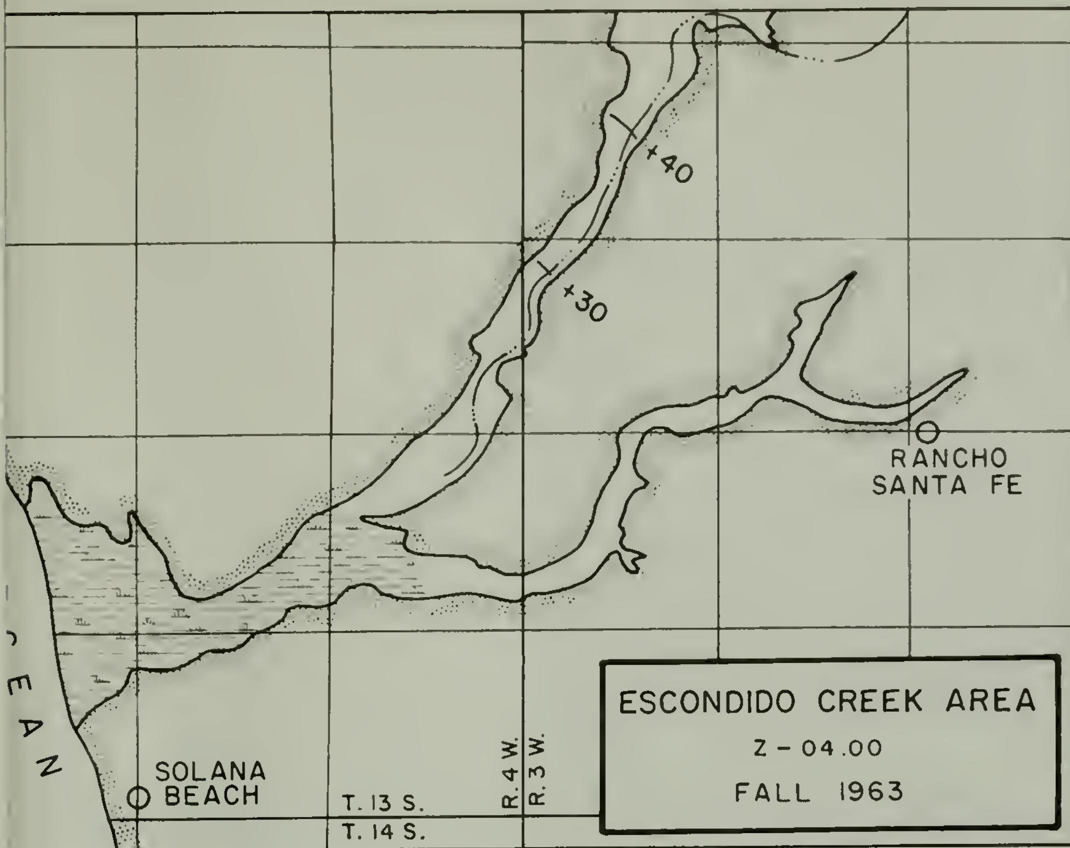
STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT
GROUND WATER OCCURRENCE AND QUALITY
SAN DIEGO REGION

LINES OF EQUAL ELEVATION OF WATER IN WELLS IN SELECTED AREAS

SCALE OF MILES

1 0 1 2

1966



LEGEND

—— +40 —— LINE OF EQUAL ELEVATION OF WATER IN WELLS IN ALLUVIUM (QAL)

BOUNDARY OF VALLEY FILL AREA

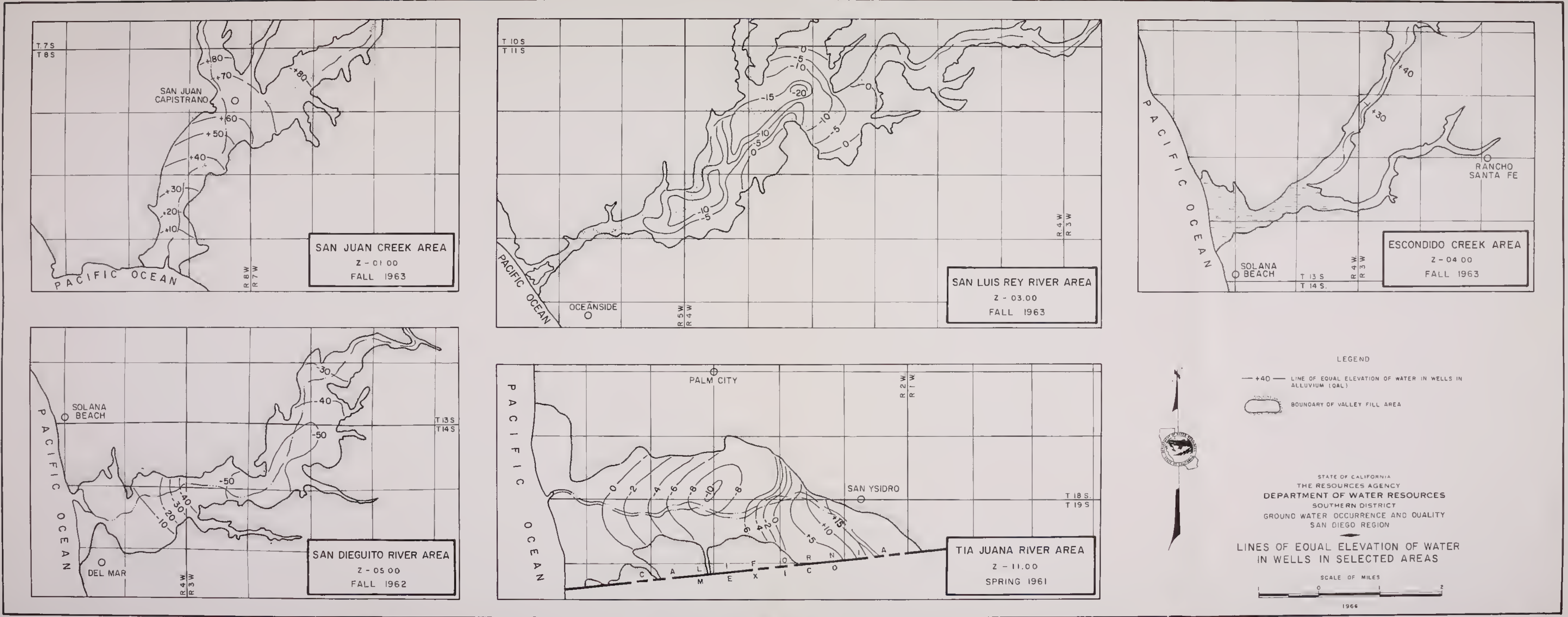
STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT
GROUND WATER OCCURRENCE AND QUALITY
SAN DIEGO REGION

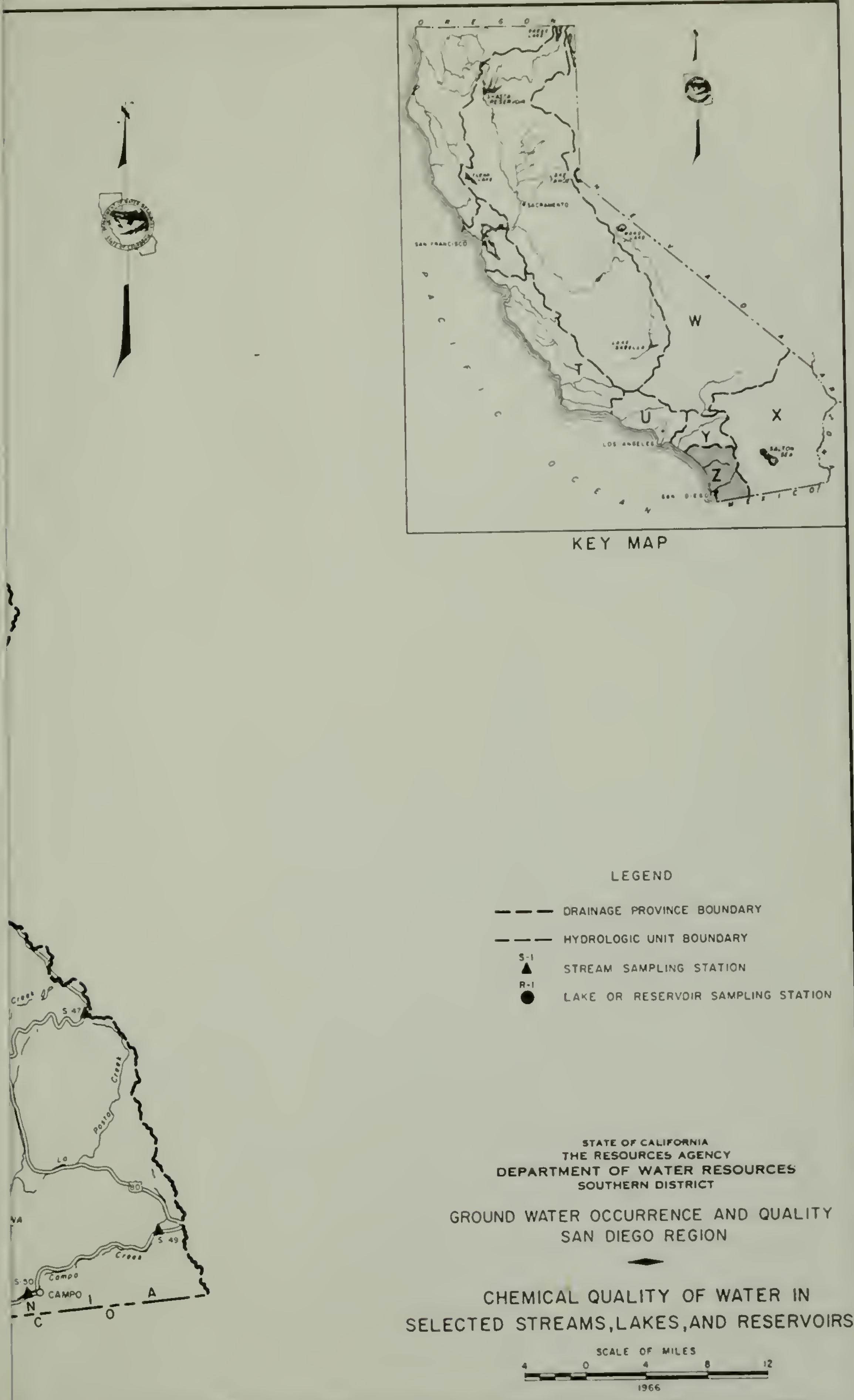
LINES OF EQUAL ELEVATION OF WATER IN WELLS IN SELECTED AREAS

SCALE OF MILES

1 0 1 2

1966

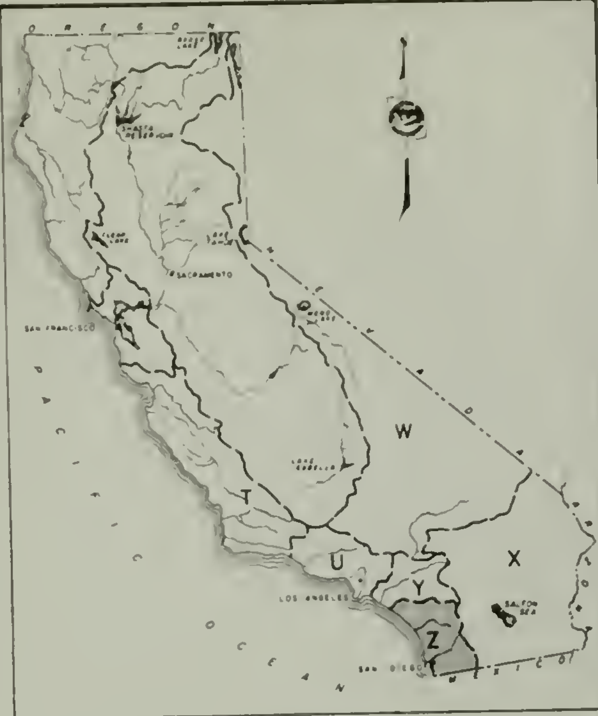

T.7S
T8S
SAN JUAN CAPISTRANO
+80
+70
+80
+60
+50
+40
+30
+20
+10
PACIFIC OCEAN
R8W
R7W
SAN JUAN CREEK AREA
Z - 01.00
FALL 1963
T 10S
T 11S
0
-5
-10
-15
-20
-10
-5
0
-10
-5
PACIFIC OCEAN
OCEANSIDE
R5W
R4W
R4W
R3W
SAN LUIS REY RIVER AREA
Z - 03.00
FALL 1963
PACIFIC OCEAN
+40
+30
RANCHO SANTA FE
SOLANA BEACH
T 13 S
T 14 S.
R4W
R3W
ESCONDIDO CREEK AREA
Z - 04.00
FALL 1963
SOLANA BEACH
PACIFIC OCEAN
-30
-40
-50
-50
-40
-30
-20
-10
T13S
T14S
DEL MAR
R4W
R3W
SAN DIEGUITO RIVER AREA
Z - 05.00
FALL 1962
PALM CITY
R2W
R1W
PACIFIC OCEAN
0
2
4
6
8
10
8
6
4
2
0
+5
+10
+15
SAN YSIDRO
T 18 S.
T 19 S
CALIFORNIA
MEXICO
TIA JUANA RIVER AREA
Z - 11.00
SPRING 1961
LEGEND
+40 LINE OF EQUAL ELEVATION OF WATER IN WELLS IN ALLUVIUM (QAL)
BOUNDARY OF VALLEY FILL AREA
STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT
GROUND WATER OCCURRENCE AND QUALITY
SAN DIEGO REGION
LINES OF EQUAL ELEVATION OF WATER IN WELLS IN SELECTED AREAS
SCALE OF MILES
1 0 1 2
1966



STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT

GROUND WATER OCCURRENCE AND QUALITY
SAN DIEGO REGION

CHEMICAL QUALITY OF WATER IN
SELECTED STREAMS, LAKES, AND RESERVOIRS



KEY MAP

LEGEND

DRAINAGE PROVINCE BOUNDARY

HYDROLOGIC UNIT BOUNDARY

S-1 STREAM SAMPLING STATION

R-1 LAKE OR RESERVOIR SAMPLING STATION

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT

GROUND WATER OCCURRENCE AND QUALITY
SAN DIEGO REGION

CHEMICAL QUALITY OF WATER IN
SELECTED STREAMS, LAKES, AND RESERVOIRS

SCALE OF MILES

4 0 4 8 12

1966

PLATE 10

KEY MAP

LEGEND

- DRAINAGE PROVINCE BOUNDARY
- HYDROLOGIC UNIT BOUNDARY
- ▲ STREAM SAMPLING STATION
- ● LAKE OR RESERVOIR SAMPLING STATION

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT

GROUND WATER OCCURRENCE AND QUALITY
SAN DIEGO REGION

CHEMICAL QUALITY OF WATER IN
SELECTED STREAMS, LAKES, AND RESERVOIRS

SCALE OF MILES
4 0 4 8 12

1966